

AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT**

NOVEMBER 15, 1957

In This Issue

**New Cadillac and Ford Passenger Cars for 1958
Latest British Designs at the London Motor Show
Twelfth Annual Technical Convention of the ASBE
Highlights of SAE National Aeronautic Meeting
Lincoln's Plant for Unitized Body Construction
Annual Convention of the Magnesium Association**

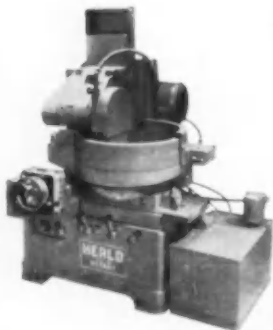
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A C H I L T O N P U B L I C A T I O N



Large work? Low RMS finish?

Here's a shining example.



***The 30" Heald Model 361 Rotary
does an outstanding surface grinding job***

Take this case for instance. The column-type rotary Model 361-30" is designed to precision surface grind relatively large work. The wheel grinds on its periphery, producing a concentric finish highly desirable in certain applications. The 361 is now available with either a 24" or 30" magnetic chuck, and can easily handle work of the size shown above. This piece has a 2-4 R.M.S. finish and a flatness of .0001 in 30". Send for Bulletin 2-361-1.

***IT PAYS TO COME
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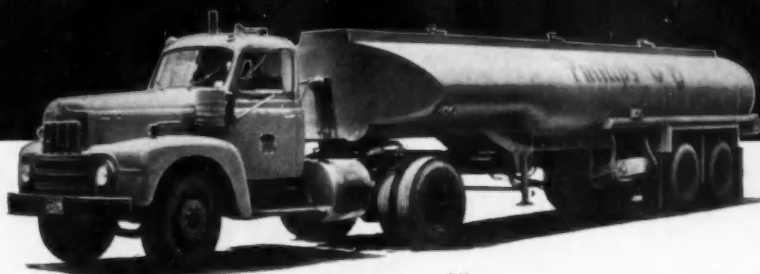
TURBO-SUPERCHARGED DIESELS							
MODEL	Cyl.	*Features	Bore and Stroke	Displ. Cu. In.	Max. Torque @ RPM	Max. HP	RPM
197-DLCS	6	ATV	4 x4	302	275-1800	131	2800
135-DKBS	6	ACTV	4 1/4 x5	426	400-1800	185	2800
148-DKBS	6	ACTV	5 1/4 x6	779	706-1800	280	2100
WAKDBS	6	ACTV	6 1/4 x6 1/2	1197	1062-1600	352	1800
NORMAL DIESELS							
180-DLC	4	AC	3 1/2 x3 3/4	144	102-1800	45	2400
185-DLC	6	A	3 1/2 x3 3/4	216	152-1000	60	2400
190-DLCA	6	AC	3 3/4 x4	265	191-1400	84	2800
195-DLCA	6	AC	4 x4	302	221-1800	98	2800
197-DLC	6	AV	4 x4	302	216-1600	91	2800
135-DKB	6	ACV	4 1/4 x5	426	328-1600	147	2800
148-DKB	6	ACV	5 1/4 x6	779	584-1000	200	2100
WAKDB	6	ACV	6 1/4 x6 1/2	1197	845-1000	258	1800
GASOLINE							
180-GLB	4	AC	3 1/2 x3 3/4	144	118-1600	45	2400
185-GLB	6	A	3 1/2 x3 3/4	216	176-1400	67	2400
190-GLB	6	A	3 3/4 x4	265	223-1200	77	2400
195-GKA	6	ACV	4 1/4 x4	320	244-1400	122	3000†
MZA	6	A	4 1/4 x4 3/4	404	289-1000	128	2800†
135-GKB	6	ACV	4 1/4 x5	426	337-1200	147	2800†
135-GZB	6	ACV	4 3/4 x5	451	354-1200	153	2800†
140-GKB	6	ACV	4 1/2 x5 1/2	525	426-800	177	2600†
140-GZB	6	ACV	4 3/4 x5 1/2	554	453-800	188	2600†
145-GKB	6	ACV	5 1/4 x6	779	594-1000	240	2400†
145-GZB	6	ACV	5 3/4 x6	817	652-1200	260	2400†
WAKB	6	ACV	6 1/4 x6 1/2	1197	997-1000	280	1800

*FEATURES: A—Aluminum Alloy Pistons; C—Counterbalanced Crankshaft; T—Turbo-Supercharged; V—Vibration Dampener.

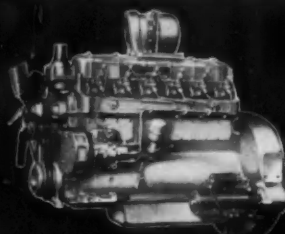
†These engines rated at higher hp and rpm for fire engine service. Send for Bulletin 1079 for LPG ratings and complete listing of engine hp and speed ratings.

WAUKESHA ENGINES

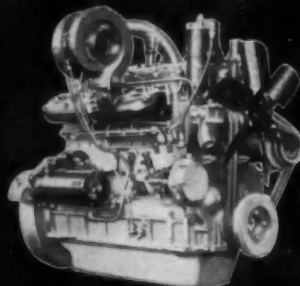
**NORMAL and TURBOCHARGED DIESELS
... GASOLINE ... LP GAS**
Standard or Counterbalanced Crankshafts



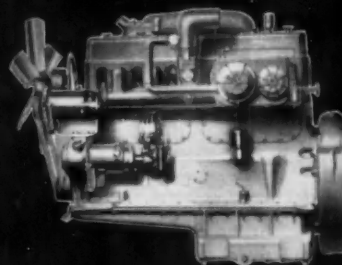
361



197-DLCS—Turbocharged Diesel
(Also normally aspirated)



135-DKBS—Turbocharged Diesel
(Also normally aspirated)



WAKB—Equipped for butane

Write for descriptive bulletins
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STANDARD PRESSED STEEL CO.

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JENKINTOWN PENNSYLVANIA

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

NOVEMBER 15, 1957

VOL. 117, NO. 10

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used**



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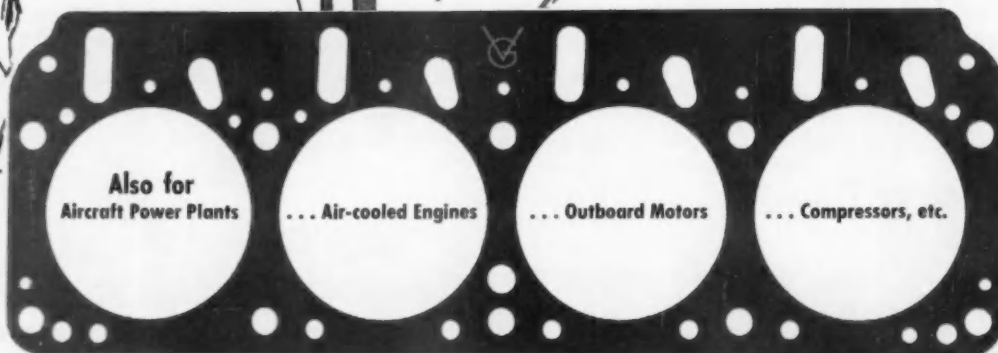


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handles like
fabric

TRADE-MARK (Registration Applied for)



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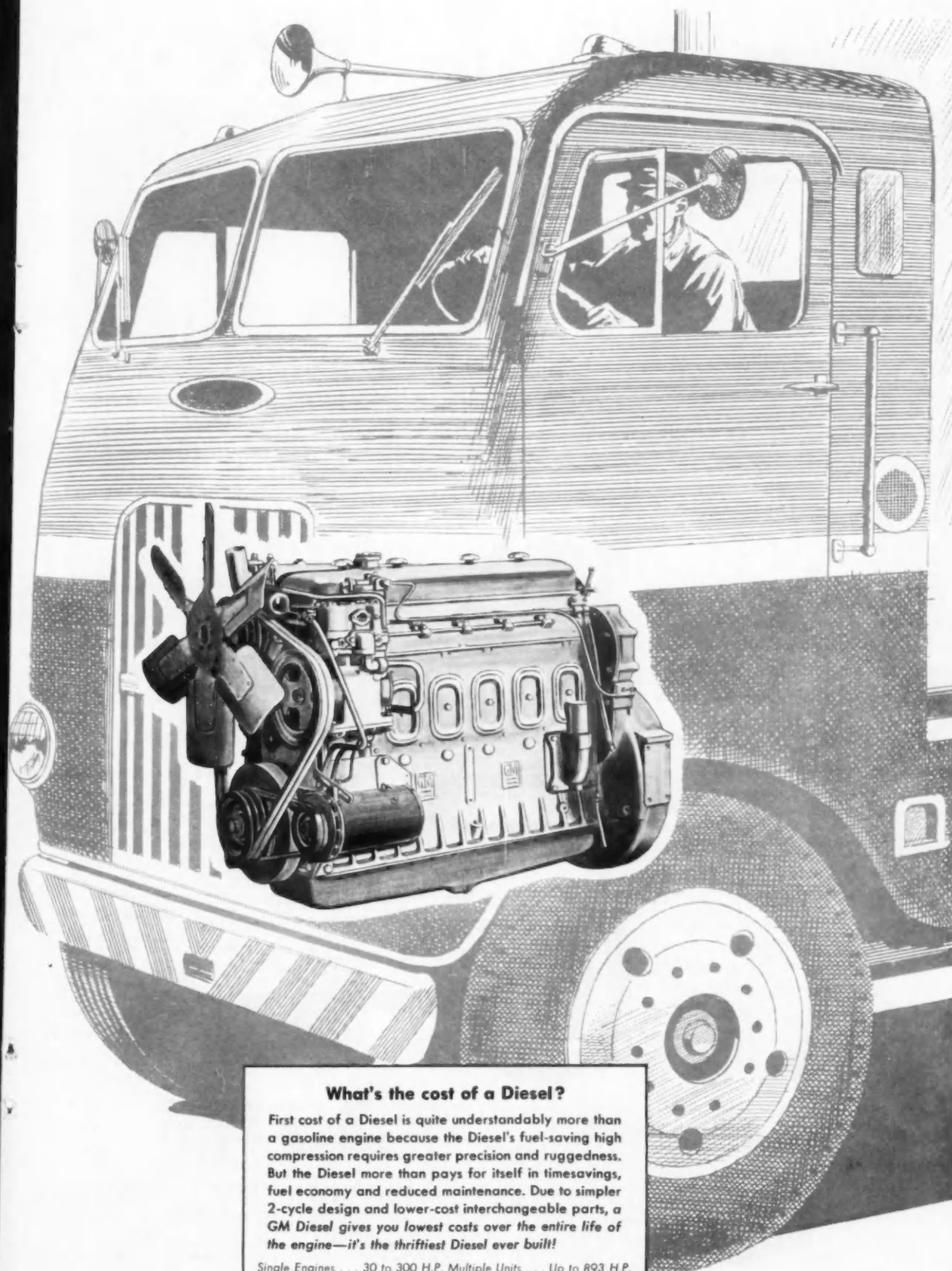
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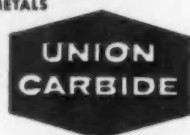
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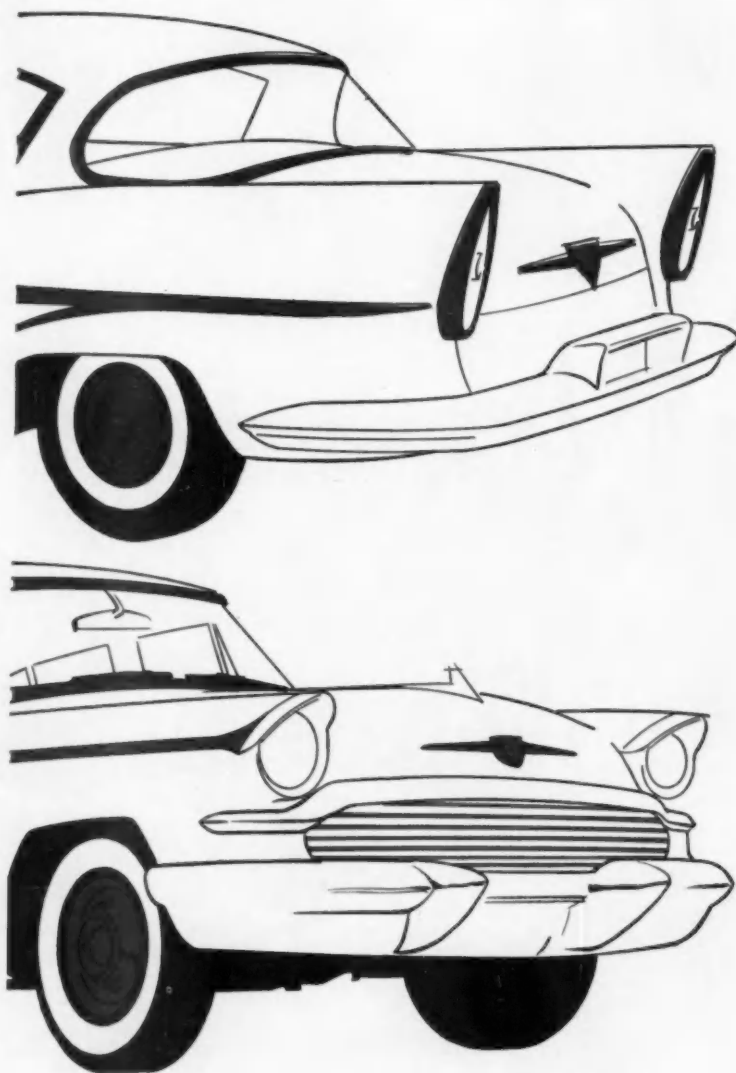
For more facts about stainless steel see your supplier or write: ELECTRO METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

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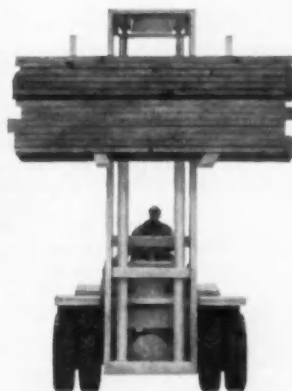
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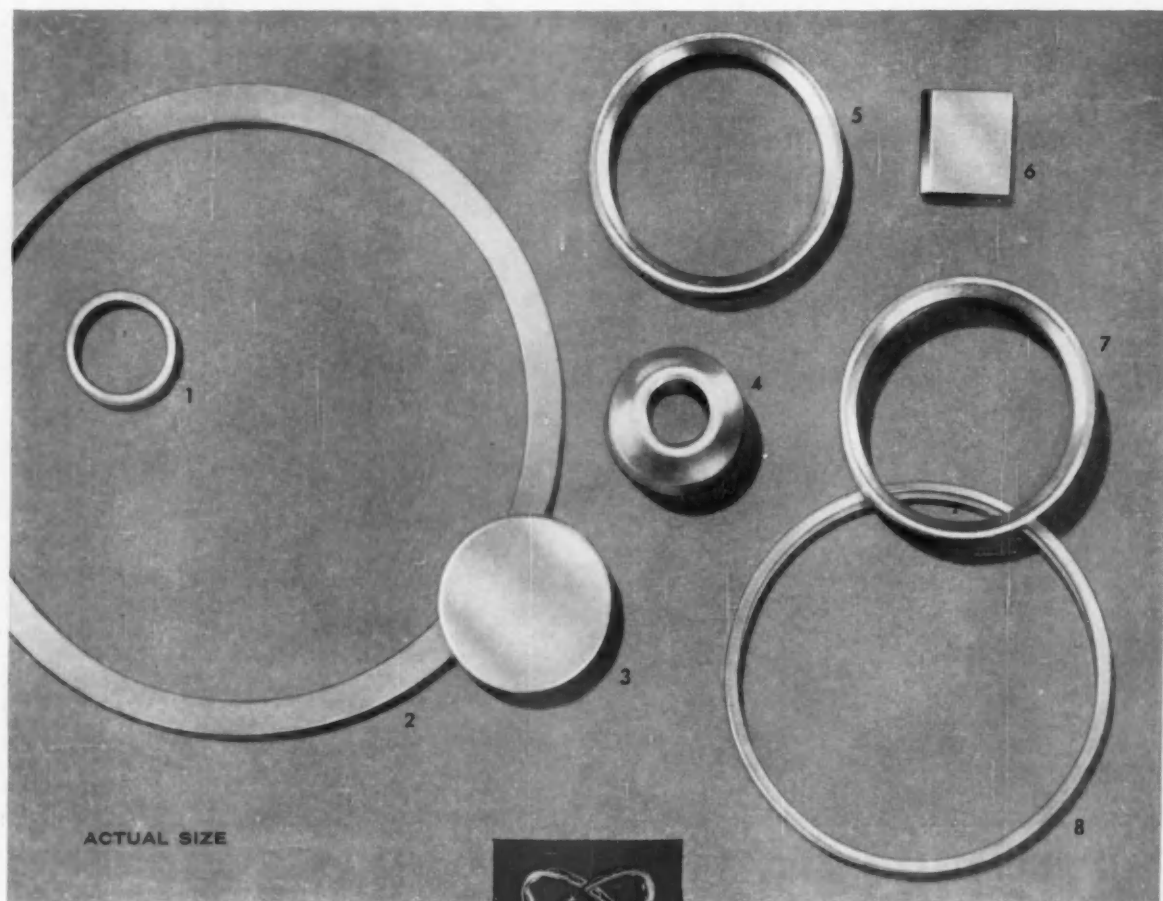
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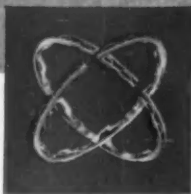
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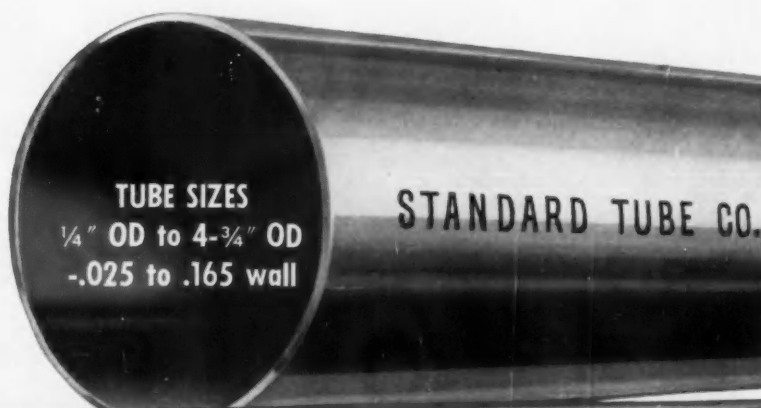
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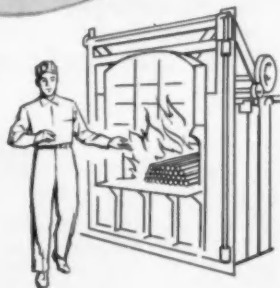
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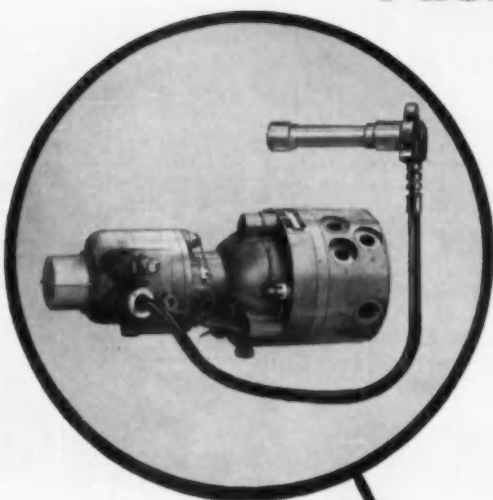
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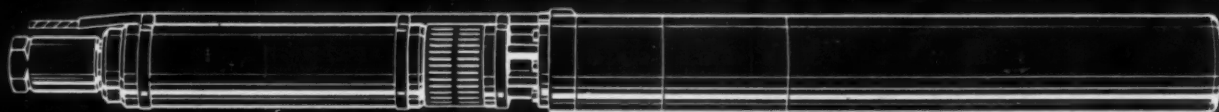
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Get all the facts on savings from Mr. Tubes, your link to B&W. Call your local B&W tubing distributor. Write for Bulletin TB-419. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



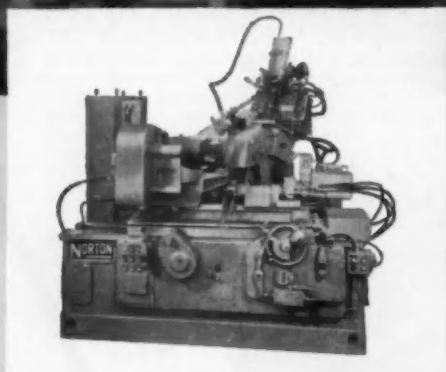
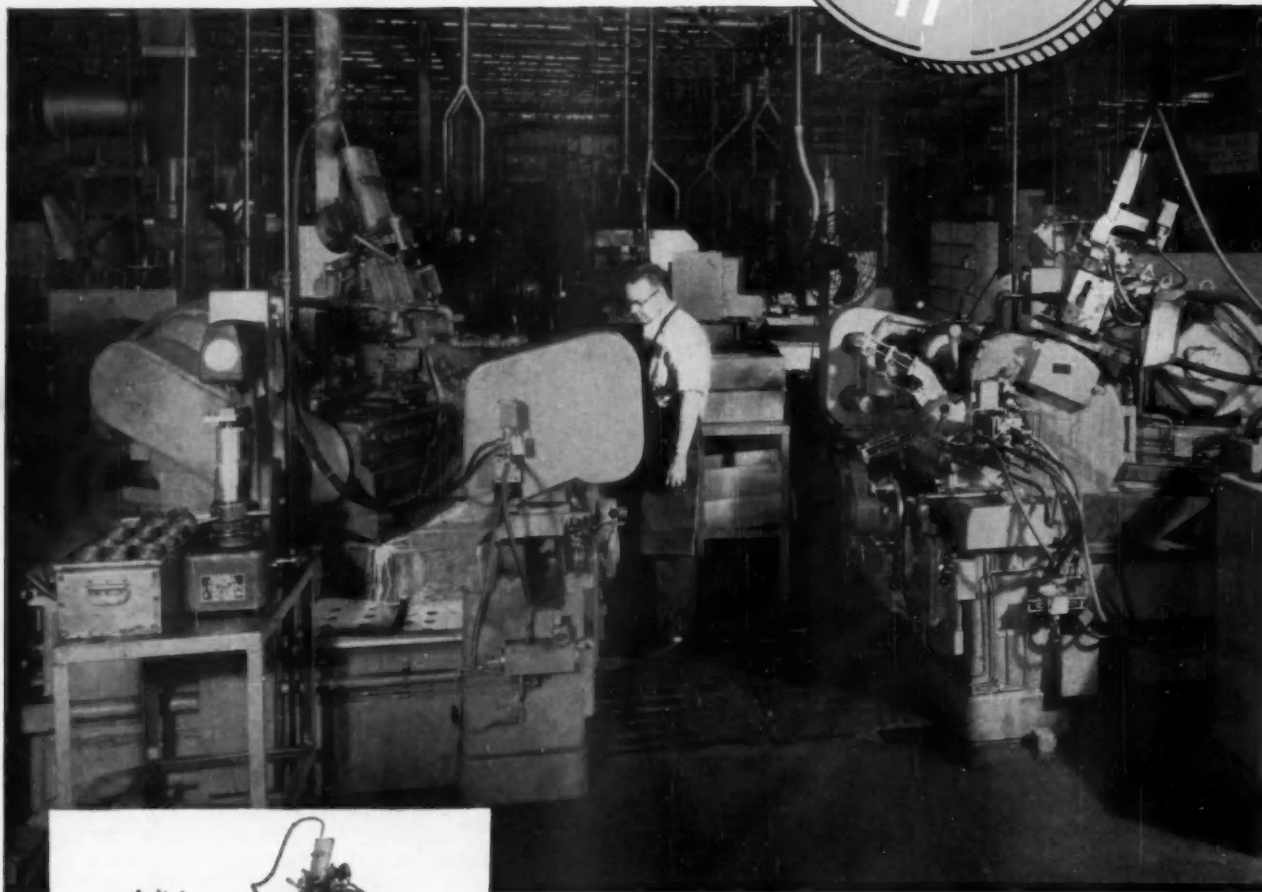
TA-6088-M4

Seamless and welded tubular products, seamless welding fittings and forged steel flanges — in carbon, alloy and stainless steels

First grinder to do this job — this way!

Versatile Norton Type CV-4 Machines in big transmission plant

enable new
cost-cutting
operation



TWO NORTON TYPE CV-4 10" Automatic Angular Wheelslide Grinders that have made possible a new, improved grinding method in the transmission plant of a prominent automotive manufacturer. (See other photo and diagram for details.) These two machines are tended by a single operator, who merely keeps the automatic loading device supplied with parts and removes ground parts from the unloading chute. Designed to grind thrust surfaces and adjacent diameters in one automatic plunge grind, Type CV-4's eliminate the usual separate operation on the shoulder or thrust surface. They are available with hand table or hydraulic power table traverse in 10" and 14" sizes, and in work lengths of 18", 36", 48" or 72".

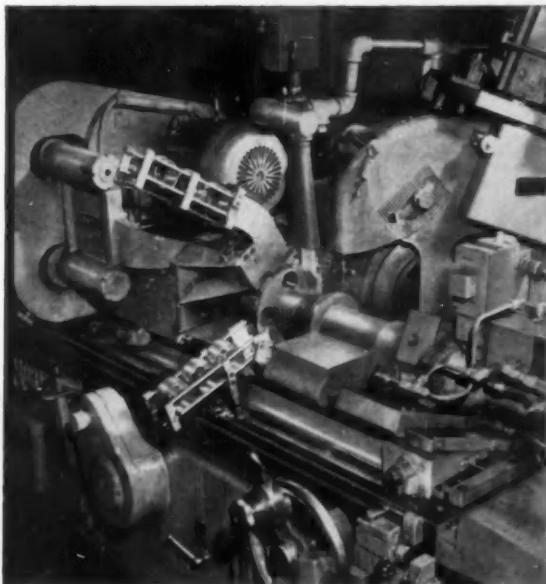
The job described here proves how easily the Norton Type CV-4 Automatic Angular Wheelslide Grinder can be adapted to meet individual needs for more efficient grinding operations.

Doing several fast, precision grinding jobs at once is routine performance for this advanced cylindrical grinder. And it does them better! For example, it leaves a concentric grain pattern in the thrust surface finish, improving the seal surface and appearance. Other "Touch of Gold" advantages for rapid grinding action and top-quality production, with simplified operation and maintenance include:

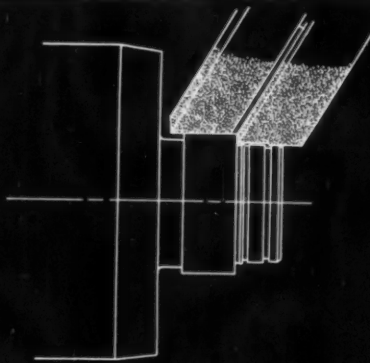
- Automatic wheel feed with "click-count" index enables settings for wheel slide movement in increments as fine as .00005". Graduated wheel feed hand wheel indicates amount of feed as it rotates. Both length and rate of automatic wheel feed easily adjusted from operation position.
- Automatic wheel head mounted truing device (optional) provides push-button control of straight, stepped or formed truing — eliminates need of skill and reduces wheel cost per piece ground.
- Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.

Type CV-4's in YOUR Production

can do the work of two or more ordinary cylindrical grinders. Why not get more facts on how replacing obsolete grinding equipment with these modern machines can improve your competitive position and increase your grinding profits? Ask your Norton Representative for Catalog No. 1658-1, or write us direct. And remember, only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.



NEVER DONE BEFORE! A close-up of one of the Type CV-4 Grinders in the larger photo. Workpieces are being fed into the chuck from a Norton automatic turret-type loading device. An automatic angular plunge grind, followed by automatic traverse off the piece grinds the diameters and leaves a sharp corner at top of the shoulder — a new time-saving way to do this job. Stock removal is .025" on diameters and .005" on face. Inset diagram shows surfaces ground and sharp corner left on shoulder.



To Economize, Modernize with NEW



GRINDERS and LAPPERS

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to make your products better*

District Offices: Worcester • Hartford • Cleveland
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NORTON PRODUCTS: Abrasives • Grinding Wheels
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BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cut Tapes

Automatic transmission seal problem—

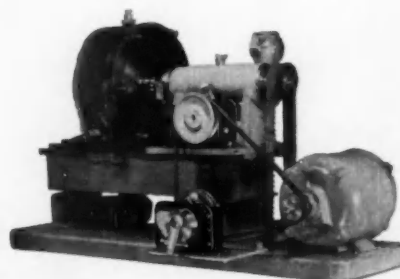


New National Syntech® proves dependable answer in front pump seal position

Constant temperatures of 250°F, peaks of 300°, continual change in shaft speed, and total inaccessibility of the seal without costly teardown—these are a few of the sealing problems in the front pump of today's automatic transmissions for passenger cars.

To help meet this challenge, National engineers have produced a new oil seal. The new design, a steel encased, spring-loaded unit with Syntech synthetic sealing lip, is characterized by an unusually long flex section in the lip, a special, light-loading tension spring, and the time-tested, low torque Syntech lip itself.

Factory engineers report that the new National seals are proving extremely reliable in the application. Dealers also find the front pump seals are very reliable and do not require early replacement.



To design and thoroughly test the new seal, National engineers developed a new transmission simulator which exactly duplicates front pump operating conditions at all car speeds.



Get real help on seal engineering problems. Call the National Engineer.

NATIONAL SEAL Division, Federal-Mogul-Bower Bearings, Inc.

General Offices: Redwood City, California; Plants: Van Wert, Ohio, Downey and Redwood City, California



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... Hannifin valves



Our "NE" valve—one of several Hannifin 4-way directional air control valves. Ask your Hannifin man when to use it.

Persistent research is bringing Hannifin valves to the most forward position in the field of pneumatic controls. These valves are opening up new areas of progress for sequential automatic production.

The Hannifin valves you buy today incorporate the very latest results of never-ending testing and development. Versatility of application and dependability of operation are winning them their position of leadership.

See your Hannifin man. Find out for yourself why Hannifin air control valves are so rapidly becoming first choice for automatic operation.

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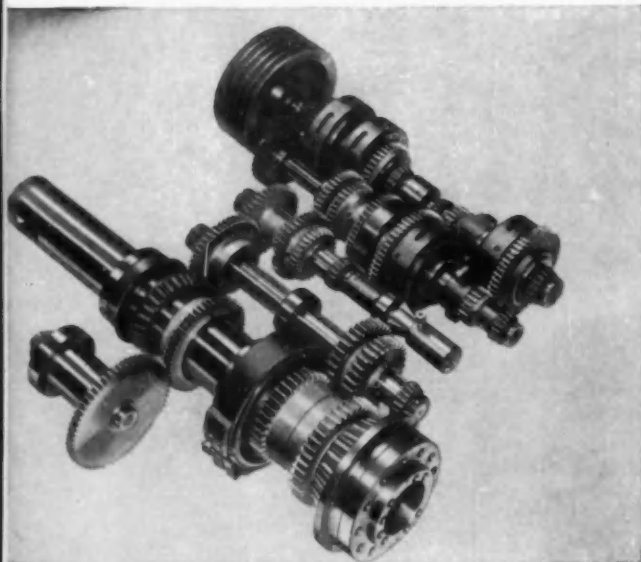
HANNIFIN

VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Corporation, 543 South Wolf Road, Des Plaines, Illinois.



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NEW HEADSTOCK GEAR TRAIN—sixteen different spindle speeds available, powered by up to 30 h.p. single-speed driving motor delivering full power at all speeds. Spindle is mounted on selected pre-loaded, precision-tapered roller bearings. Heavier, more rugged design provides smoother, quieter power.

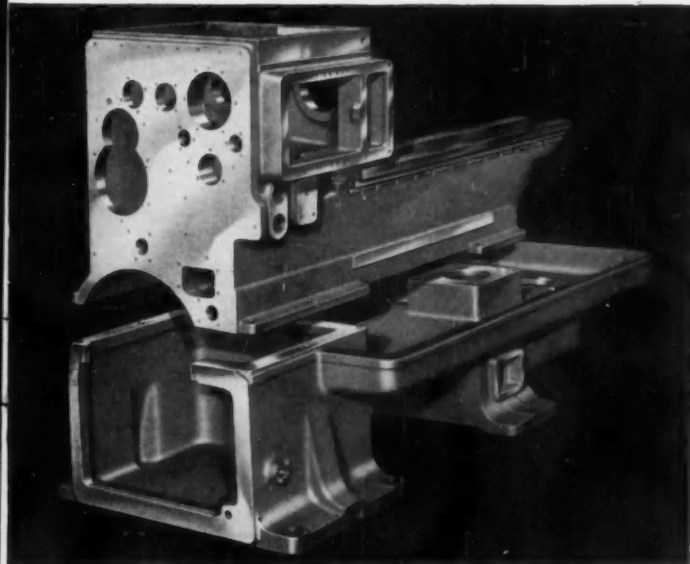


HYDRAULIC SPEED SELECTOR—smooth, effortless speed changes. No waiting, no computing, no stopping of spindle, no releasing of main drive clutch. Operates direct or pre-set. Hi-Lo Lever permits instantaneous speed changes in 8:1 ratio without moving Speed Selector handwheel. Multiple Disc Clutches have automatic take-up for wear.

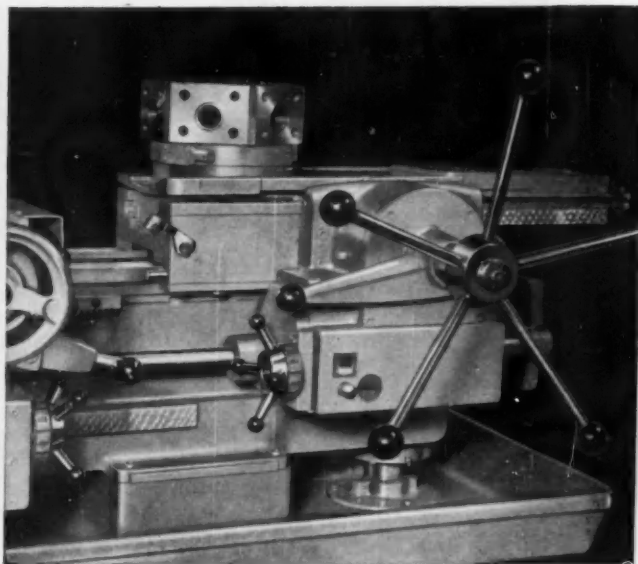
YOU GET THEM ALL...PLUS NEW GISHOLT MASTERLINE



WANT HEAVY CUTS WITHOUT VIBRATION?



NEW HEADSTOCK AND BED CASTING—scientific design dampens out vibrations, assures smooth operation and simplifies holding closer tolerances. Made from semi-steel, poured in Gisholt's own foundry. Greater swing over ways permits bigger chucks and broader range of workpiece sizes. Provides a solid foundation for all types of work.



NEW TURRET RAM AND SADDLE—designed wider, heavier, more rigid to handle increased capacity and higher speeds. Dial-type feed selector makes feed changes faster, easier. Turret ram rigidly supported on 64-66 Rockwell C alloy steel way strips. Power transmitted through serrated tooth clutches, with shear pin protection against overloading.

GREATER VERSATILITY...WITH THE RAM TYPE TURRET LATHE

YOU'LL SPEED UP your production jobs—both large and small—with this more powerful, more versatile Gisholt MASTERLINE Ram Type Turret Lathe.

Here is a machine designed from end-to-end for easier setups, faster change-over and higher productive output than ever before. Check the advanced features illustrated above. Note the reserve power to handle your heaviest cuts—and to meet your tooling requirements of tomorrow. Note the extra spindle speeds—all at your operator's finger tips, without computing—for faster, better turning of

any type material. And look over the new massive design, the over-all ruggedness that permits greater accuracy, closer tolerances, deeper cuts at punishing feeds without vibration.

Find out now how this powerful, flexible Gisholt MASTERLINE Ram Type Turret Lathe can reduce floor-to-floor time on your specific jobs. Call your Gisholt Representative today—let him show you how this advanced machine can fit most profitably into your production picture. Or write direct to Gisholt for the new literature described below.

READY NOW—all-new, 18-page illustrated Bulletin No. 1174-B, covering features, accessories, tools and floor plans on new Gisholt MASTERLINE Ram Type Turret Lathes. Ask for it!

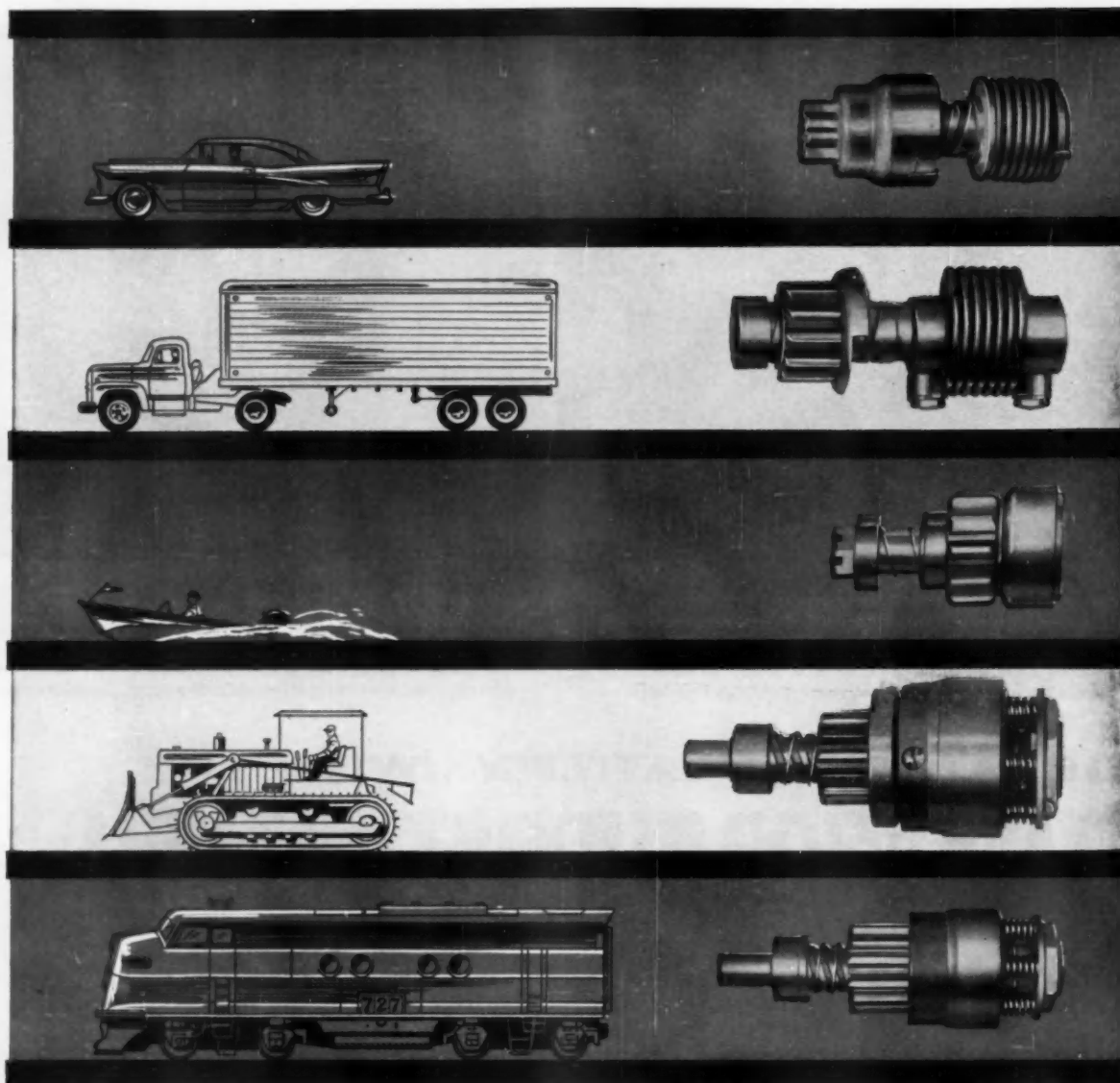


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BIG OR SMALL . . . BENDIX DRIVES START THEM ALL

Throughout the world of transportation it's an accepted fact that *you start with Bendix!* And it's not surprising. Bendix* Starter Drives have been synonymous with dependability for fifty years in the automotive field. They've proved themselves just as reliable on submarines, aircraft, earth movers, outboard motors, helicopters. In fact, every type of internal-combustion

engine ever built has used a Bendix Starter Drive. Hospitals use Bendix Drives to activate their stand-by equipment. Air raid sirens across the country are started with Bendix Drives. It's logical to believe that such universal acceptance indicates a standard of quality which no other manufacturer has been able to match. Need we say more?

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Koldweld Division, Kelsey-Hayes Co., Utica 4, N.Y.

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N-A-X[®] FINEGRAIN STEEL

DELIVERS STRENGTH

WITH TOUGHNESS



No more dramatic test of a steel's combined strength and toughness could be devised than the kind of job performance which Caterpillar Tractor Co. builds into its products.

As Caterpillar equipment literally moves the earth, bulldozer blade surfaces and scraper bowl bottoms must stand up to gruelling punishment. In these critical components, Caterpillar standards for steel are of the highest. N-A-X FINEGRAIN steel meets those standards with the right combination of strength with toughness.

And to this manufacturing operation, like so many others, N-A-X FINEGRAIN brings other important benefits as well. For example, the excellent weldability of N-A-X FINEGRAIN steel makes it exceptionally adaptable to Caterpillar's exacting requirements.

Review these salient advantages for your job: N-A-X FINEGRAIN steel, compared with carbon structural grades,

is approximately 50% stronger • has high fatigue life with great toughness • is cold formed readily into difficult stampings • is stable against aging • has greater resistance to abrasion • is readily welded by any process • offers greater paint adhesion • polishes to a high luster at minimum cost. And the physical properties of N-A-X FINEGRAIN are inherent in the "as rolled" condition. N-A-X FINEGRAIN's resistance to normal atmospheric corrosion is twice that of carbon structural steel.

NOTE: Where greater resistance to extreme atmospheric corrosion is an important factor, our N-A-X HIGH-TENSILE is recommended.

For whatever you make, from tractors to pressure cylinders, with N-A-X HIGH-STRENGTH steels you can design longer life, and/or less weight and economy into your products.



This bowl bottom assembly of the Caterpillar No. 470 Scraper requires numerous individual welding operations in its manufacture. Not only the parent metal, but the welds themselves, must have strength with toughness. Again, N-A-X FINEGRAIN steel proves its excellent weldability.



Here Caterpillar Earthmoving Equipment pushes America's great highway program forward. A Cat® DW 21 and matching No. 470 Scraper lead the way. The Cat DW 21 is assisted by a Caterpillar-built crawler Tractor.



N-A-X Alloy Division, Dept. J-9

GREAT LAKES STEEL CORPORATION

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N-A-X Alloy Div., Dept. J-9

Great Lakes Steel Corp., Detroit 29, Michigan

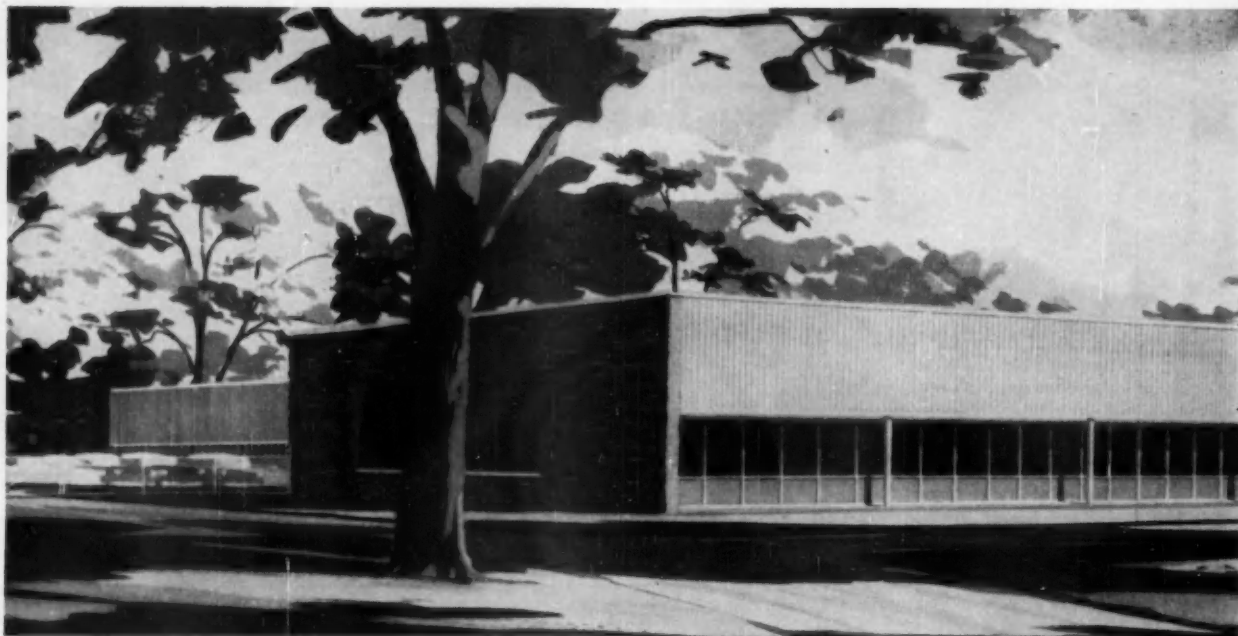
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☐ Please have your representative contact me.

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Company _____

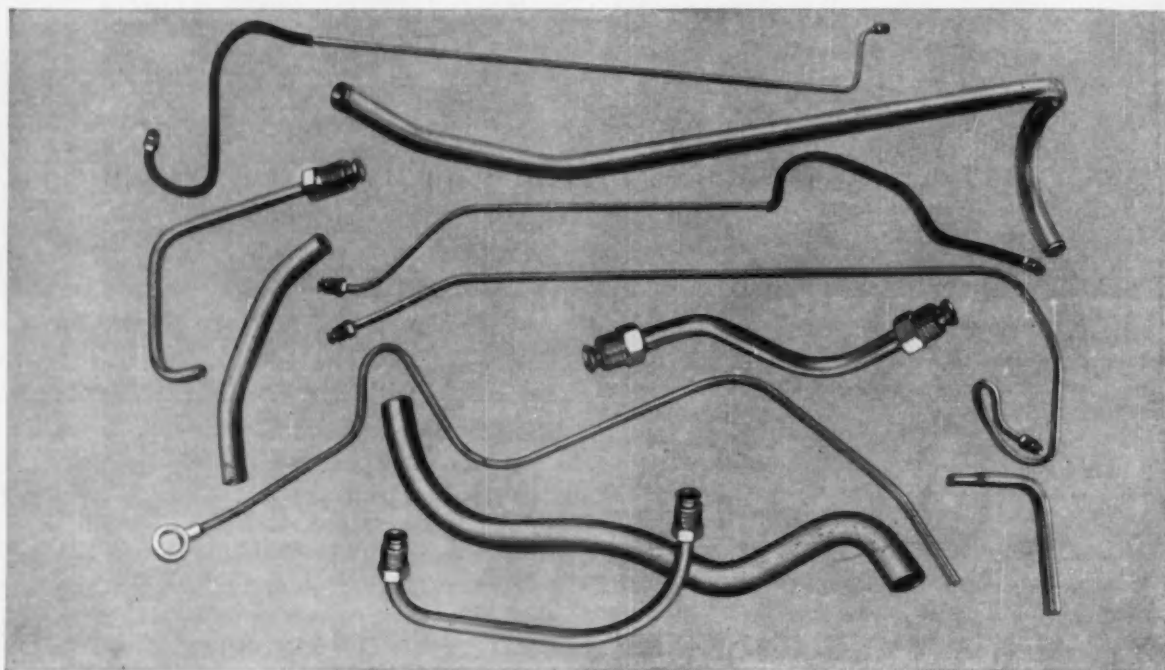
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To satisfy your demand for fabricated parts:

Bundy Tubing



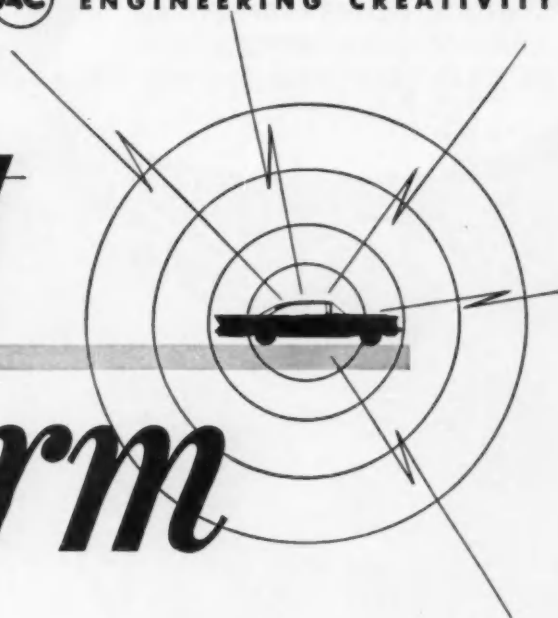
These typical automotive tubing parts now are in mass production at Bundy's new Winchester Division. Strong, leakproof Bundyweld Tubing,

fabricated into a variety of complex shapes, is used on 95% of today's cars, in an average of 20 applications each.

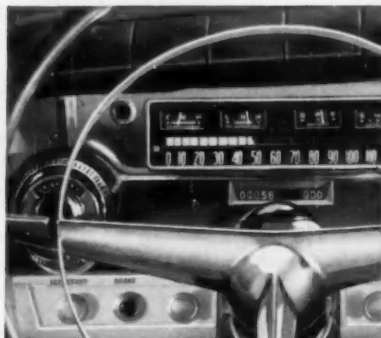
ANOTHER GREAT PRODUCT OF **AC** ENGINEERING CREATIVITY!



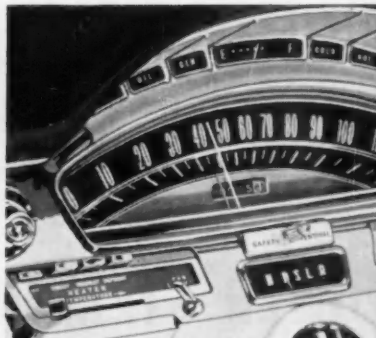
speed alarm



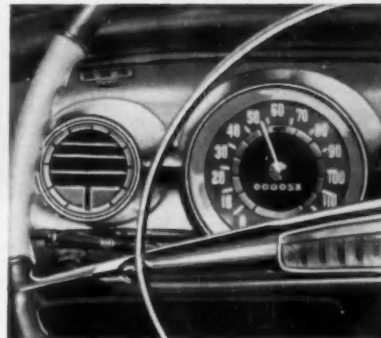
Lets you hear as well as see
when your speed is legal or safe!



BUICK for 1958 calls it the
"SAFETY BUZZER"



OLDSMOBILE for 1958 calls it the
"SAFETY SENTINEL"



PONTIAC for 1958 calls it the
"SAFEGUARD"

ANOTHER AC FIRST!

AC, always vitally interested in working for safety, is specially proud of the great forward stride taken when AC engineers developed the pre-set speed alarm, making it possible for the driver to set the legal or safe speed he wants to observe so that a buzzer warning will occur when that speed is reached.

The AC speed alarm system is typical of AC ingenuity in developing new, consumer-appeal equipment. AC will gladly work with your engineers and designers. Consult any AC office.

AC  THE ELECTRONICS DIVISION OF GENERAL MOTORS



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in 340,000 Buicks for 1957

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SURE, POWER STEERING
MAKES THE JOB EASIER.
BUT IT'S THE ADDED SAFETY
THAT COUNTS MOST.

OUR POWER-STEERED
RIGS STAY ON SCHEDULE
BETTER, TOO.

EITHER WAY,
POWER STEERING MAKES
GOOD BUSINESS SENSE.

THE CASE FOR POWER STEERING ON TRUCKS!

The trend to power steering on trucks is based on one very practical reason—operators of trucks equipped with power steering have invariably found that the added safety and greater operating efficiency of their vehicles have demonstrated that power steering is indeed a sound investment.

Truck drivers using power steering report less tension and fatigue in normal driving and appreciate the positive control that blocks road shock from chuck holes and prevents loss of control if the truck is forced out on a soft shoulder.

The dispatcher knows the importance of regularly maintained schedules. He is quite aware that with power steering drivers are more relaxed and are better drivers than tired drivers. Thus, power steering not only reduces the hazard of road accidents, but helps the driver to maintain established schedules through better vehicle control.

In short, power steering, by saving time and money, contributes materially to a more profitable operation.

Truck manufacturers are always eager to offer their customers features

that will make truck operation safer and more profitable and, at the same time, give their dealers every selling advantage.

That's why more and more truck manufacturers are offering performance-proven Bendix* Power Steering as original factory equipment.

If you would like to know why power steering for trucks is perhaps even more logical than power steering for passenger cars, we have prepared an interesting folder on the subject.

Write for your copy today. We think you'll be convinced.

*REG. U.S. PAT. OFF.

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High Spots of This Issue

▼ Lincoln's New Plant

The new Lincoln plant in Wixom, Mich., was built from the ground up around the concept of unitized body construction. Shown here are the unique facilities and methods used for unitized body car assembly. Page 52.

▼ London International Motor Show

The 42nd International Motor Show reflected the improved fortunes of the British automobile industry. The various trends in the industry as evidenced in the displays are covered by AUTOMOTIVE INDUSTRY's British correspondent. Page 58.

▼ 1958 Ford Line

A fresh styling theme, a new series of V-8 engines, a dual range automatic transmission, and a new air suspension system are among the many features offered by Ford Div. for 1958 and described in this article. Page 62.

▼ SAE Aeronautical Meeting

New high strength, heat resisting materials and advanced production processes were among the topics discussed at the SAE Aeronautical Meeting held in Los Angeles recently. This article covers the highlights. Page 68.

▼ Multiplying Markets for Magnesium

Industry representatives who attended the recent Magnesium Association Convention were primarily interested in future markets, and this concern was reflected in the technical papers, extracts from some of which are presented here. Page 72.

▼ 32 New Product Items

And Other High Spots, Such As:

New GMC truck model; 1958 Cadillac; World Metallurgical Congress; German show; Simmonds fuel injection system; assembly methods at Fruehauf Trailer Co.; new intercity bus; Caterpillar testing laboratory; national safety conference; AGMA meeting; and industrial hydraulics conference.

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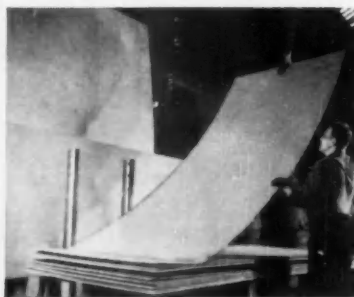
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When you want stainless fast... anything from one to 2351 types, shapes, sizes and finishes... telephone Ryerson. You can

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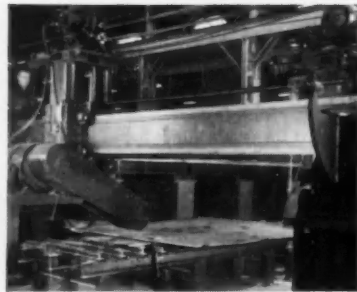
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STAINLESS PIPE AND TUBING—Light wall, standard and extra heavy pipe, ornamental and regular stainless tubing. Also screwed and welding fittings and Cooper stainless valves.



STAINLESS CIRCLES, RINGS, SPECIAL SHAPES—No matter how intricate, we can flame-cut practically any shape from stainless steel plate. One piece or a thousand.



TRUE-SQUARE ABRASIVE CUTTING—Stainless plates up to 12' x 25' cut absolutely square on abrasive disc machine. Length and width tolerance plus or minus 1/32".

Principal products: Carbon, alloy and stainless steel — bars, structurals, plates, sheets, tubing, industrial plastics, machinery and tools, etc.



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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 117, No. 10

November 15, 1957

Heavy Expenditures Foreseen For Bodies, Engines, Axles

Heavy expenditures during the next several years are foreseen for tooling and machinery for new developments in automobile bodies, engines, axles, transmissions and even for new small cars.

One of the key developments, and perhaps the most imminent, is the transaxle, or close combination of transmission and rear axle, with the transmission mounted either on top of or directly forward of the rear axle. Under study for some time, the transaxle now seems to be just around the corner. One member of the Big Three reportedly has earmarked more than \$100 million for tooling for the transaxle. Target is said to be production during 1960 with introduction on at least three 1961 model cars.

When and if the rest of the automobile industry makes the switch, the tooling and equipment bill could top \$300 million.

The transaxle could lead to new concepts in styling and body design, since the floor pan of an automobile could be completely flat and much lower. Rear engine mounting is not out of the question.

One major body development not hinging on the transaxle is the switch by one large company to the unit body construction, reportedly for 1960 models. While cost has been a deterrent factor for volume producers, this company apparently now considers cost as secondary.

Aluminum engines are still at least a few years off, but their future seems fairly certain. Chevrolet is said to be closest to finalization.

The small car is also getting more attention. Ford and Chrysler reportedly are getting close to formulating small car manufacturing programs for this country. Chrysler still has no small car to market, either here or in export. Ford, although more active



STANDARD ADDS ANOTHER SMALL CAR TO LINE

The Pennant is the latest addition to Standard's range of small cars. Like the "Ten" model, it is powered by a 57.8-cu in. engine with 8 to 1 compression ratio and rated at 37 hp at 5000 rpm. A steering-column shift lever is used on the four-speed transmission. Distinctive styling features include squared-off front-end treatment and a large rear window.

than a year ago, still is not pushing its English-built Fords through its dealers in this country. Studebaker-Packard has been considering tooling to produce the small German Goggomobil in the U. S.

GMC Expands Engineering Staff To Develop Trucks for Future

GMC Truck & Coach Div., with an eye on the future, has expanded its engineering department 22 per cent in the last year in an effort to develop a line of trucks that would be a "complete and radical" departure from present truck design.

Philip J. Monaghan, GM vice-president and general manager of the truck division, told a news conference in Detroit last month that GMC's Engineering Dept. is one of the largest in General Motors since its recent expansion. The idea, he pointed out, is

to make a complete reassessment of the product, "with a view toward incorporating into it everything of value, in a single design pattern, now known to our engineering world." Delivery of developments up to now has been on a piecemeal basis, he said.

GMC's 1958 truck line went on display Nov. 11 at dealer showrooms. Featured in the new line are a new V-8 engine, stronger chassis, and a new automatic transmission for medium-duty models.

R. C. Woodhouse, GMC general sales manager, told the newsmen that 1957 truck sales could equal 1956 deliveries, or approximately 1.1 million units. He said he saw no reason why 1958 should show any substantial change from 1957 sales levels and that the resurgence of the half-ton truck had been a significant development in 1957. It accounted for 51 per cent of all truck registrations through August of this year.



Cornell-Liberty Safety Car eliminates all non-functional exterior ornament.

Cornell-Liberty Safety Car Can Withstand 50-MPH Crash

The prototype of a "crash-proof" car from which its designers claim passenger can emerge unhurt after a 50-mph head-on collision was unveiled in New York City recently.

The experimental car was developed after five years of automotive safety research carried out by Cornell Aeronautical Laboratory, Inc., and sponsored by Liberty Mutual Insurance Co.

Research showed, according to the sponsors of the car, that most automobile injuries were caused when passengers were thrown against the windshield, steering wheel, dash, or

other fixed objects inside the car. To eliminate these hazards, Liberty and Cornell developed a vehicle that packages its riders like fragile merchandise in an unusual seating arrangement.

The steering wheel has been eliminated. In its place a lever-controlled hydraulic system has been installed, which minimizes danger to the driver in case of accident. The driver's seat, of the bucket type, is located in the center, and flanked by two similar seats.

The body has been strengthened, and the doors that work like those

of telephone booths have been designed so that the force of a crash cannot open them. Other safety features are reinforcement bars on the roof, conical section rear window and windshield, shock absorbing bumpers, and a seat facing to the rear.

The new car was built, its sponsors said, to encourage increased automotive safety designs in the industry.

Prices of 1958 Cars Up Approximately 3 Per Cent

Prices of 1958 cars, announced within recent weeks, reflect increases of slightly more than 3 per cent, considerably less than the nearly 7 per cent increase a year ago. New car price increases range from \$7 for the De Soto Fireflite Shopper to \$241.04 for the Cadillac Sedan de Ville four-door hardtop.

There were, however, a few noticeable exceptions to the general price trend. The Continental Mark III two-door hardtop, for example, has a suggested list price \$3842 below its 1957 counterpart. And AMC's Ambassador V8 is priced below 1957 Nash and Hudson models. In both cases, it should be pointed out, the 1958 cars are not actually comparable to 1957 models. Continental is new—it shares the Lincoln body shell and manufacturing costs; and the Ambassador shares the 1958 Rambler body shell.

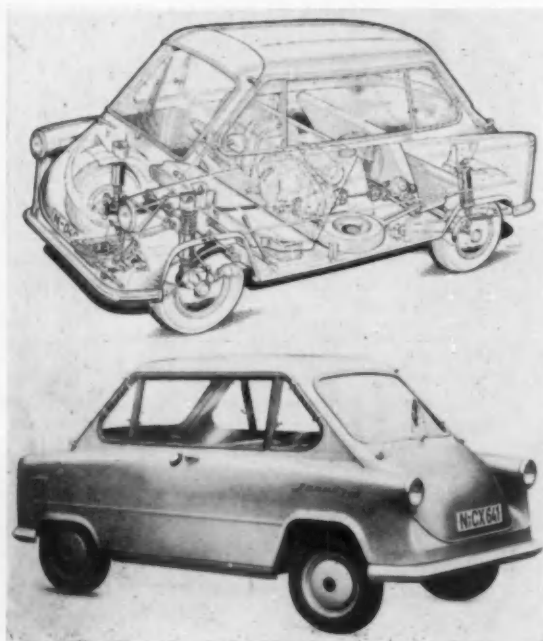
Chevrolet increased its factory price 4.5 per cent on its six-cylinder models and 5 per cent on V-8's. Ford's increase averaged 2.5 per cent—lower partly because of price reductions of from \$14 to \$42 in four models — and Plymouth's increases averaged 2.9 per cent for all models.

Generally, Chrysler Corp. cars held their increases below the other Big Three manufacturers. Chrysler's tooling costs for 1958 were considerably lower than either Ford or General Motors.

Edsel Finishes, Ford Commences Production at Somerville Plant

Edsel Div. has ended production at the Ford Motor Co. plant at Somerville, Mass., and the Ford Div. is scheduled to begin building cars after mid-November. Edsel Div. used the eastern plant for Citation and Corsair production until mid-October in order to build up inventories.

Production of Citation and Corsair—the top models in the Edsel line—is continuing at the Lincoln and Mercury Div. plants at Wayne, Mich., and Los Angeles, Calif. Edsel Div. says the switch will not interfere with scheduled deliveries.



GERMAN MINICAR

Janus, newest German built four-passenger import, is powered by a one cylinder, two-stroke engine that develops 16 hp. The power plant is located midway between the front and rear axles, distributing the weight evenly to all four wheels. Front seat is conventional, but rear faces towards the back. Janus has four forward speeds and a reverse, hydraulic four-wheel brakes, independent four-wheel suspension, torsion bars and hydraulic shock absorbers for varying loads. Janus is manufactured by the Zundapp motorcycle factory in Nürnberg, and will sell in the U. S. for \$1190 f.o.b. N. Y. City.

Aluminum Reinforcements Used To Strengthen Corvette Body

Chevrolet is using 30 strategically placed aluminum reinforcements, combined into a single unit, to add rigidity to the plastic body of the 1958 Corvette. The reinforcements form a skeleton structure on both sides and the front of the passenger compartment, and the improved rigidity reduces the relative movement between the doors and the body to provide better weather seals.

In addition, the skeleton serves as a sort of jig, aiding accurate control of certain dimensions in body assembly. A truss-like structure extends across the cowl under the windshield frame, and down the door hinge pillars to the rocker panels. Tying in with this are flanged members running the length of the door opening in the body rocker panels.

The rearward end of the rocker panel reinforcements connect with vertical braces adjacent to the door lock pillars. Brackets to receive the folding top linkage are located at the top of the vertical braces. In the doors, aluminum reinforcement assemblies add rigidity to the door structure and the window run channel assembly.

Chrysler Corp. Dollar Sales Chalk Up Nine-Month Record

Chrysler Corp. dollar sales during the first nine months of 1957 set a company record and topped 1956 nine-month sales by 48 per cent. Net earnings during the period were second only to the 1950 record, but topped last year's earnings by more than 16 times.

Sales through Sept. 30 totaled \$2,745,802,865, and net earnings totaled \$103,575,486. A year ago, sales totaled \$1,858,437,251, and net earnings were \$6,272,352.

Passenger car and truck shipments during the period totaled 1,082,801 units, an increase of 42 per cent over 1956. Third quarter shipments amounted to 265,300 units, compared with 171,217 for the same period in 1956.

Chrysler reported that defense business during the first nine months of 1957 amounted to \$94 million, or three per cent of total sales, compared with \$140 million (eight per cent) a year ago.

Capital expenditures for improvements and additions to land, buildings, machinery and equipment in the first nine months of 1957 were \$85,170,494, compared with \$70,792,483 in the same period of 1956.



1958 CORVETTE OFFERS WIDE RANGE OF OPTIONS

Chevrolet's 1958 Corvette is powered by a standard 283-cu in. V-8 engine with single four-barrel carburetor and 9.5 to 1 compression ratio. Options include dual carburetors with fuel injection, or fuel injection with a special camshaft that boosts the compression ratio to 10.5 to 1. A special axle, a hydraulic folding top, electric window lifts, and a heavy-duty suspension system are offered too.

Eastman Kodak Co. Develops New High-Strength Adhesive

A new liquid adhesive that is described as "unique in its combination of rapid-set-time and high strength" has been developed by Eastman Kodak Co.

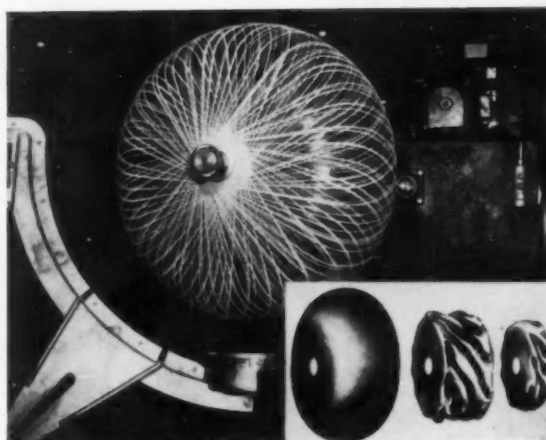
The adhesive, a cyanoacrylate compound, has been applied successfully to a wide variety of materials, including metals, glass, wood, ceramics, rubber, plastics, and even human skin. Among the metals tested, combinations of steel, aluminum, copper, magnesium, bronze, and brass were bonded effectively, according to Eastman Kodak.

The rapidity with which strong bonds are formed, the company said, depends upon the nature of the materials being bonded. Tests have shown glass-to-glass bonds to be unbreakable within 5 to 15 seconds. Steel-to-steel bonds set in 15 to 20 seconds, and develop 2000 psi tensile strength within 30 minutes and 5000 psi after 48 hours.

The new material, which is called Eastman 910 Adhesive, is still in the experimental stage. One ounce sample kits, however, are available to experimenters, design engineers, and laboratories at a cost of \$5.00 each, the company announced.

FOLDING TIRE

Engineers at Fairchild Aircraft Div. have developed two innovations in airplane tires. One, a continuous high tensile nylon cord, wound about the tire body provides extra support. The other is an automatic vent system for deflating and folding of the tire so it can be stored in the same space now required by standard types. Inset shows (left to right), fully inflated tire, partial deflation, and folded tire.





FORD TRACTOR HAS INCREASED DRAWBAR HORSEPOWER

New all-purpose Powermaster, most powerful tractor ever built by Ford Motor Co., is available in six models with 44 drawbar horsepower, an increase of 10 per cent over previous models. The improved 172 cu in. engine, has a compression ratio of 7.5 to 1. Standard fuel is gasoline, with factory-installed liquefied petroleum gas engines available as options.

GM Sales for Nine Months Up, But Income Declines from '56

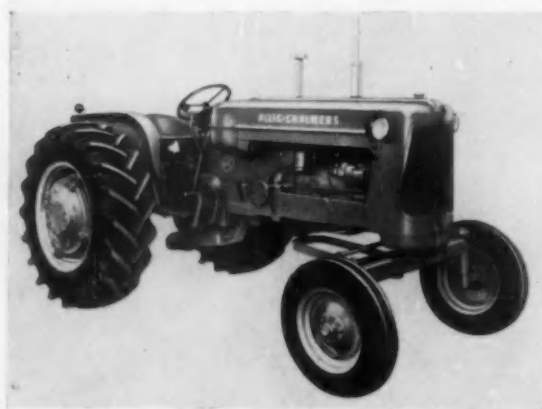
General Motors' dollar sales rose during the first nine months of 1957, but net earnings dropped for the first three quarters and the third quarter. Sales climbed to \$8,235 million in the first nine months, compared to \$8,144 million in the like period a year ago. For the third quarter, sales were \$2,321 million, up from \$2,275 million a year ago.

But net earnings dropped from \$620 million through Sept. 30 a year ago to \$603 million this year. For the quarter, earnings dropped from \$137 million to \$122 million.

Sales of passenger cars and trucks during the third quarter of 1957 were 811,143 units, 97 per cent of last year's sales. For the nine months, sales were 2,908,482, or 93 per cent of the total a year ago.

AMC Reports Rambler Sales To Oct. 20 Top Full 1956

American Motors Corp. reports that sales of Rambler cars through Oct. 20 topped sales for the full 12 months of 1956. Rambler sales totaled 72,856 units from Jan. 1 through Oct. 20, compared with 71,300 in all of 1956. Rambler's record sales were 73,807 in 1955.



ALLIS-CHALMERS TRACTOR

Allis-Chalmers D-17 tractor, which will pull a 5-bottom moldboard plow, is available with choice of two new engines — gasoline or Diesel—each rated at 50 hp plus. Weight is approximately 5280 lb with gasoline engine, and wheelbase is 93 in. The Diesel-powered tractor weighs approximately 5,680 lb and wheelbase is 95-3/4 in.

Ford Earnings Up 58 Per Cent; Sales Hit High for the Period

Ford Motor Co. net earnings for the first nine months of 1957 totaled \$229,500,000, or 58 per cent higher than the \$145,200,000 reported for the same period of 1956. Sales during the same period set a new record for the company, reaching \$4,419,200,000, or 37 per cent higher than last year's \$3,233,300,000.

Passenger car and truck sales through Sept. 30 of this year totaled 1,742,208 units, an increase of 362,145 over the same period of 1956.

Employment and payroll during the first nine months of this year also set new records. During the period, an average of 193,672 hourly and salaried employees earned \$910,875,072, topping the previous high of 1955.

NIC Looking for Solutions To 387 Technical Problems

The National Inventors Council, Dept. of Commerce, has compiled a list of 387 technical puzzles as yet unsolved by military research teams.

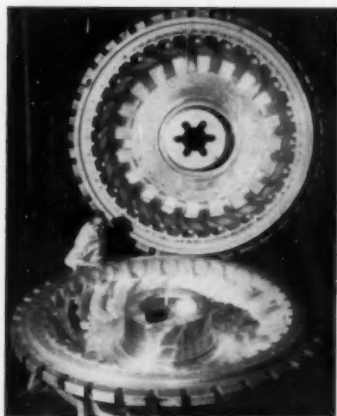
The baffling problems are described in the Council's new publication, "Inventions Wanted by the Armed Forces," which was prepared in co-operation with the Army, Navy, and Air Force. The council is the liaison agency between inventors and the armed services.

The new problems are in the fields of aeronautics, missiles and space travel, electronics, chemistry, metallurgy, instrumentation, automotive engineering, and others.

Among the "inventions wanted" are: a tunneling machine that can bore through earth at 6000 ft per hour, a constant speed generator driving device, silent engines, a method for decreasing fuel consumption of gas turbine engines, a method of increasing the horsepower output of reciprocating engines, an automotive military drive system for operating electric generators and alternators, self-cleaning oil filters, new ignition system, etc.

General Tire Begins Production At New Synthetic Rubber Plant

General Tire & Rubber Co. has opened its \$10 million synthetic rubber plant at Odessa, Tex. The plant, which has an annual capacity of 40,000 long tons, is receiving its basic raw material, butadiene, from the nearby Odessa Butadiene Co., also a new plant. General Tire began production at a rate of 75,000 lb a day, or about 30 per cent capacity.



ALUMINUM TIRE MOLD

Alcoa aluminum tire mold back-up sections are being readied for installation in one of Goodyear Tire & Rubber Company's tire plants. The mold sections each weigh more than 7500 lb and are almost nine feet in diameter. They will be used to cure mammoth tires for construction equipment.

Benson Ford Sees Possibility For Improved Sales in 1958

Benson Ford, vice-president of the Ford Motor Company, predicted this month that automobile sales in 1958 may show "marked improvement" over the 1957 level, partly because the number of new-car credit contracts that will mature in 1958 will exceed by 900,000 those maturing this year. This increase in credit maturities, he said "could sprinkle just the kind of star-dust needed to set off another bonanza sales year in our industry and to set the whole economy humming as it did in 1955."

Mr. Ford made his optimistic prediction at a speech before the Mississippi Automobile Dealers Association.

Inboard Motor Transmission Announced by Warner Gear

Warner Gear Div. of Borg-Warner Corp. has announced a new hydraulic inboard motor boat transmission which can be adapted to any standard marine engine—or conversion—of right or left hand rotation.

The transmission, known as Velvet Drive, is said to be lighter and more compact than existing transmissions of comparable capacity and provide smooth, fast finger-tip shifting. The transmission was developed by Warner engineers in cooperation with Gray Marine Motor Co., and it is being built at Warner Gear's Muncie, Ind., plant.

AAI TABLOID

Goodyear Aircraft Corp. scientists have a design for a "manned satellite" which could be adapted for use as a space station and for nearby space explorations, such as trips to the moon. Goodyear scientists say such a satellite could become a reality within eight years time.

Ceramic scientists at Armour Research Foundation of Illinois Institute of Technology say they have developed a catalytic ceramic coating for piston heads which may significantly reduce the amount of carbon monoxide and unburned hydrocarbons in exhaust gas.

Jomac, Inc., Philadelphia, Pa., and James North & Sons, Ltd., London, England, have established two new companies to manufacture and sell each other's products in the U. S. and in principal industrial areas throughout the world.

The Neosho plant of Rocketdyne, a division of North American Aviation, Inc., will begin production this month on engines for the Atlas intercontinental ballistic missile.

National Science Foundation report on basic research in 1953—the most recent year for which such data are available—reveals that funds for basic research totaled \$435 million, or eight per cent of the estimated total of \$5.4 billion spent for research and development in the U. S.

Three new adhesives for bonding treated Teflon to other materials—wood, glass, aluminum, copper, ceramics, plastics—or to itself have been developed by the Adhesives Dept. of Raybestos-Manhattan, Inc.

The Brown Instruments Div. of Minneapolis-Honeywell, has been awarded the 1956 Public Relations News' annual "Achievement Award" for "its pioneering campaign to allay fears of automation by giving business . . . the true facts about the economic and social benefits . . ."

A large-scale plant to manufacture "Delrin" acetal resin, a new plastic material developed under Du Pont's fundamental research program, will be constructed near Parkersburg, W. Va.

A merger of The Midland Steel Products Co. and J. O. Ross Engineering Corp. has been approved by directors of both firms. The combined company will be known as Midland-Ross Corp.

Norton Co. has begun construction of an addition to its Cap-de-la-Madeleine, Quebec, silicon carbide processing plant which will increase the output capacity of the plant by 25 to 40 per cent.

Alan Wood Steel Co. will begin construction soon at Ivy Rock, Pa., of a new \$3.6 million plant for the production of iron powder.

A new facility for the development and production of fuel controls for turbine, atomic and rocket engines was dedicated recently at Windsor Locks, Conn. Built by United Aircraft Corp. for its Hamilton Standard Div., the building provides 410,000 sq ft of new engineering, manufacturing and testing space.

A. O. Smith Corp. has enlarged and given divisional status to its Milwaukee plant tooling facilities.

Westinghouse Research Laboratories has developed a new kind of magnetic steel which can be magnetized in four directions. The new material, called Cubex steel, will be used in the magnetic cores of transformers, motors, and other electrical equipment. Steel now used in magnetic cores can be magnetized in two directions only.

Clark Equipment International, C.A. has acquired a one-third interest in I.T.D., Ltd., British manufacturer of fork trucks. . . . Sheffield Corp. has purchased a major interest in M.P.J. Gauge and Tool Co., Ltd., Birmingham, England, and plans to license the British firm to make and sell all Sheffield products.

AVIATION MANUFACTURING



GRUMMAN DISPLAYS MOCKUP OF TURBOPROP PLANE

Grumman Aircraft displayed a mockup version of its turboprop observation plane at Fort Meyer, Va., recently. The two-place, twin-engine AO-1 Mohawk can be equipped with skis to land on and take-off from unprepared fields, mud, snow, and water. Its Lycoming engines each develop a take-off power of 1005 eshp. The plane will be produced for both the Army and Marine Corps.

Rocketdyne Engineers Propose Ion-Propelled Space Vehicle

A useful ion rocket engine for unmanned space vehicles can be built and operated, according to C. W. Guy, assistant general manager of Rocketdyne, a division of North American Aviation, Inc.

Such an engine—developing thrust through the high velocity discharge of ionized particles—would make possible unmanned space vehicles capable of sustained flight and directed orbits about any planet in the solar system, Guy said.

In a speech before a joint meeting of the supervision of North American's Rocketdyne and Atomics International divisions, Guy said that extensive studies by Rocketdyne have concluded that ion propulsion is a practical possibility.

Guy said an ion propelled vehicle nicknamed "Snooper" already has been suggested before a meeting of the American Rocket Society by Rocketdyne engineers M. I. Willinski and Mrs. E. C. Orr. He termed their concept "realistic."

"Snooper" would carry television, radar and other scientific instruments to send information back to Earth. Unmanned, it could be directed to orbits about the Moon, Mars or other

planets of the Solar system to collect what Guy termed "significant planetary data, including information to compare with and extend that col-

lected during the International Geophysical Year."

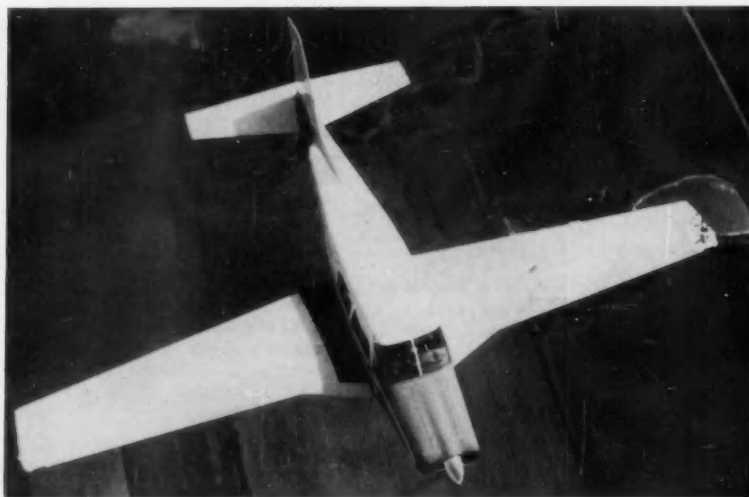
Such an ion propelled vehicle could ride to the fringe of space in the nose of a rocket—possibly through "the modification of one of our larger existing vehicles," Guy said. Once there, wing-like radiators for discharging excess heat would unfold and its nuclear powered, low thrust ion motor would begin operation.

Willinski and Orr estimate that an initial nuclear fuel charge would allow their "Snooper" vehicle to operate effectively for about one year.

Top Missile Men See Trend To Solid Fuels for Rockets

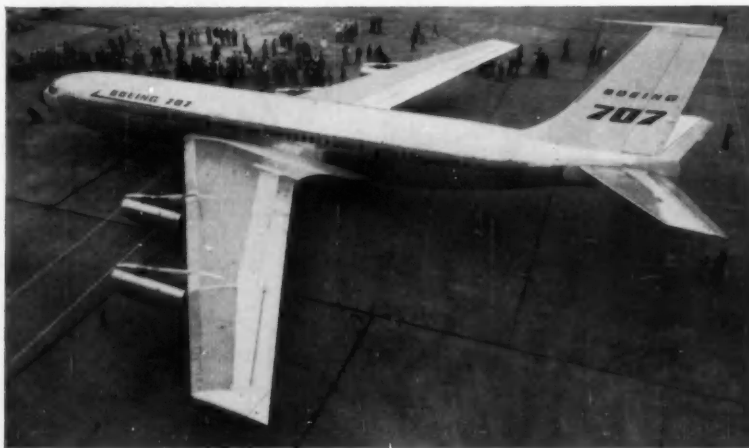
Solid fuels, rather than liquid fuels, will propel nearly all U. S. rockets before long.

Top government missile men say they are now prepared to require solid fuel propulsion in all future rocket engines. Up to now, liquid fuels have been specified in nearly all rocket engines because of greater



PIPER COMANCHE DESIGNED FOR MEDIUM-PRICE MARKET

The Piper Comanche is a low-wing, all-metal four-place business airplane in the medium-price class. It has retractable tricycle landing gear, and is powered with a Lycoming 180 horsepower engine driving a constant-speed, controllable propeller. It has a cruising speed of 160 mph at 75 per cent power at 8000 ft optimum cruising altitude and a maximum economy cruising range of 1100 miles, or 7½ hours endurance. It is priced at \$14,500 for the standard model.



JET AIRLINER BEING PREPARED FOR FIRST FLIGHT

First of the Boeing 707 Stratoliners, America's first commercial jet airliner, is shown being rolled from the Boeing plant in Renton, Wash. The Stratoliner weighs 248,000 lb fully loaded, and its four Pratt & Whitney JT3 turbojet engines develop a total of more than 40,000 lb thrust. Plane will be delivered to Pan American World Airways after flight testing, and will go into service early in 1959.

thrust potential. But new breakthroughs in solid fuels research point the way to greater thrust potentials.

William H. Holaday, special assistant to the Secretary of Defense for guided missiles, says the new plant built by Thiokol Chemical Corp. at Brigham, Utah, includes a test stand capable of testing rocket chambers up to 12 ft diameter and producing 2,000,000 lb of thrust.

This is by far the most powerful thrust now known to U. S. rocket experts.

Only a few years ago, Mr. Holaday says, such a thrust would have been thought "fantastic."

There are other advantages to solid fuels besides the greater thrust potential. Solid fuels require no elaborate fuel tanks and related plumbing. Solid fuels consist mainly of rubber matrices impregnated with chemical fuels. They're simpler, and more powerful.

Mr. Holaday says Thiokol is building solid fuels plants for several short-range missiles, such as Sergeant, Falcon, and Nike, and is also experimenting with fuel engines and fuels for the X-17 (Lockheed) missile, which is related mainly to the problem of re-entering the earth's atmosphere without burning up.

L. A. Young Buys Assets Of Aircraft Parts Firm

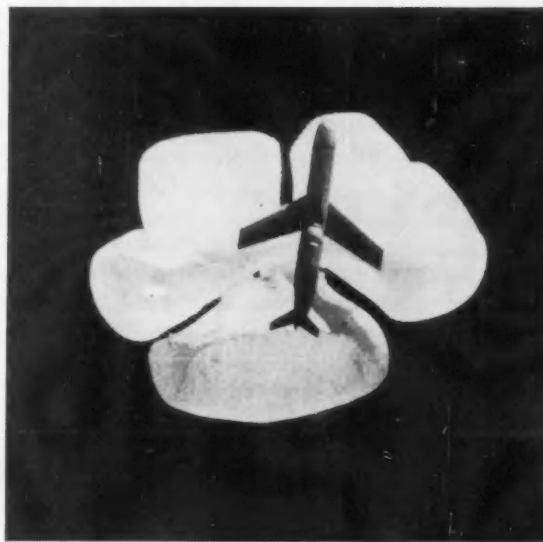
L. A. Young Spring & Wire Corp. has announced the purchase of Utility Metals Products, Inc. of Pasadena, Calif. and its subsidiary, Utility Air-

craft and Metal Products, Ltd. of Granby, Quebec. Utility makes structural parts for the aircraft and missiles industries. The company, which currently employs 900 persons in some 275,000 sq ft of manufacturing space in Pasadena, becomes a division of L. A. Young under the new set-up.

According to L. A. Young, Utility operates the largest skin mill on the West Coast, taking pieces up to 23 ft wide and 60 ft long for aircraft wing and fuselage skin fabrication. The firm produces 80 per cent of the West Coast requirements in extruded hinges for aircraft and missile manufacture.

MODIFIED MATADOR

U.S. Air Force's Matador guided missile is shown descending by means of three parachutes. Until now, a one-shot missile, the Matador has been modified so that it can be recovered and reused. Engineers at Martin Co., makers of the missile, have developed a recovery kit which replaces the warhead in training and test workouts. When flight is completed, the warhead may be reinserted, making the Matador completely operational in a short time.



Bell Aircraft Gets Contract For Rascal Guided Missile

Bell Aircraft Corp. has been awarded a "very substantial" production contract for its Rascal guided missiles.

President Leston Faneuf said the Air Force contract involves "a great many million dollars" and runs "well into 1959." The company is not permitted to reveal the number of missiles ordered or the exact dollar volume of the contract.

The large-scale production contract climaxes several years of research and development on the Rascal by Bell.

Republic Aviation Forms Commercial Contracts Unit

Republic Aviation Corp. has established a commercial contracts division as part of a drive to attract non-government business.

Mundy I. Peale, president, said that the new division would provide engineering, development, and manufacturing services to industry generally, and act as a supplier to other aviation companies and allied industries.

The reduction in defense procurement, according to Peale, has made available a part of Republic's skilled labor pool, as well as some of its scientific resources and manufacturing facilities.

Peale said that the company is looking for contracts in machining, turning, grinding, boring, forming, stamping, and other types of metal work, as well as in electrical and electronic design and assembly.

NB FACTS



"BUILT-TO-BE-FORGOTTEN" BEARINGS— FOR THE UNFORGETTABLE CARS of '58!

Here come the '58 cars! Their sleek beauty and smart, new features will be table-talk for months to come!

Among the smartest features on the leading cars are old friends—New Departure ball bearings. And if they get scant attention from car owners in all the new-car excitement, it's because they are *built to be forgotten!* Many of these bearings are sealed and lubricated-for-life. They require virtually no service attention of any kind—no periodical lubricating or adjusting.

But, to engineers responsible for the performance of the '58 cars, the ball bearing's unique advantages are of extreme importance—the ability to resist loads from *all directions*; strong, simplified end-product design, obtained because the need for various mounting, sealing and adjusting parts is eliminated.

WHERE NEW DEPARTURE BALL BEARINGS SERVE IN AMERICAN AUTOMOBILES

- FRONT WHEELS
 - REAR WHEELS
 - STEERING GEAR
 - AUTOMATIC TRANSMISSIONS
 - MANUAL TRANSMISSIONS
 - FAN AND WATER PUMP
 - GENERATOR
 - PROPELLER SHAFT
 - AIR CONDITIONING
- And many others*



NEW DEPARTURE
DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

MIEN

IN THE NEWS



Tomkins-Johnson Co.—John E. Rowe was named executive vice-president.



Reynolds Aluminum Sales Co.—John E. Blomquist has become vice-president and general manager of the Great Lakes Sales Region, and DuPont Yager has been named vice-president, automotive sales.



Associated Spring Corp., Ohio Div.—John A. Wentworth has been appointed general manager.

Ford Div., Ford Motor Co.—D. N. Frey has been appointed executive engineer, car product engineering.

International Harvester Co.—Frank W. Jenks was elected president, succeeding Peter V. Moulder, retired.

Curtiss-Wright Corp.—George R. Hill and James G. Byron, have been elected executive vice-presidents.

American Bosch Arma Corp.—Walter C. Robertson has become a vice-president.

Kelsey-Hayes Co.—Reese Lloyd has been appointed vice-president.

Waukesha Motor Co.—Charles E. Nelson, Jr., was named executive vice-president; J. Grant Swain, vice-president, sales; and Newton H. Willis, vice-president, engineering.

Dodge Div., Chrysler Corp.—Donald A. Forman and Raymond Taylor have been named chief engineers.

Twin Disc Clutch Co.—Hans Taeger has been appointed European sales manager of Twin Disc Clutch A.G.

Chrysler Corp.—A. R. Marzelli has been appointed Eastern area manager of new vehicle sales.

General Motors Corp., Moraine Products Div.—Arthur Shaw has been appointed assistant chief engineer; Francis J. Markey, sales manager of automotive assemblies; and Hubert D. Glass, sales manager of friction materials, bearings and sintered metal parts.

Dow Chemical Co.—P. H. Cardwell has been appointed technical specialist in technical service and development.

E. W. Bliss Co.—William Staecker has become assistant manager of engineering of the Press Div., and Alfred Drain succeeds him as chief engineer of the Canton Div.

AC Spark Plug Div., General Motors Corp.—Robert L. Korth was named Chicago regional manager for replacement product sales; Edward J. Brandl, merchandising manager for oil filters, fuel pumps and gasoline strainers; and Benjamin J. Filer, merchandising manager for air cleaners, Guide Lamp, hydraulic valve lifters, and gas, oil, and pressure caps.

Motch & Merryweather Machinery Co.—Alvin J. Jones has been appointed director of engineering.

Federal-Mogul-Bower Bearings, Inc.—Walter E. Thill is now chief engineer of the Service Engineering Dept., and Edward F. Bauman has been promoted to director of purchasing staff activities.

Jomac, Inc.—H. Howard Colehower has been named president of Jomac-North, Inc., and Geoffrey K. White was appointed managing director of North-Jomac, Ltd.

Valvair Corp.—J. E. Collins has been elected chairman of the board, and W. F. Kruspe succeeds him as president and general manager.

Houdaille Industries, Inc.—Gerald C. Saltarelli was elected senior vice-president.

E. W. Bliss Co.—Richard Y. Moss has become manager of special product sales, and Charles E. Peterson was named manager of manufacturing operations for Mackintosh-Hemphill Div.

Necrology

Paul D. Merica, 68, retired president of International Nickel Co. of Canada, Ltd., died Oct. 20, at Tarrytown, N. Y.

Clayton R. Burt, 84, former president of Niles, Bement, Pond Co., now the Pratt & Whitney Div. of Penn-Texas Corp., died Oct. 21, at West Hartford, Conn.

Horace W. Merriman, 78, formerly in charge of the Philadelphia sales office of Alan Wood Steel Co., died Oct. 18, at Philadelphia, Pa.

Gilbert Butler, 70, former president and general manager of Boscort Co., now a division of Rockwell Spring & Axle Co., died Oct. 13, at Utica, N. Y.

William H. Pinckard, 63, retired chairman of California Texas Oil Co., Ltd., died Oct. 20, at Palo Alto, Calif.

Giovanni Caproni, 71, Italian aviation pioneer, died Oct. 27, at Rome, Italy.

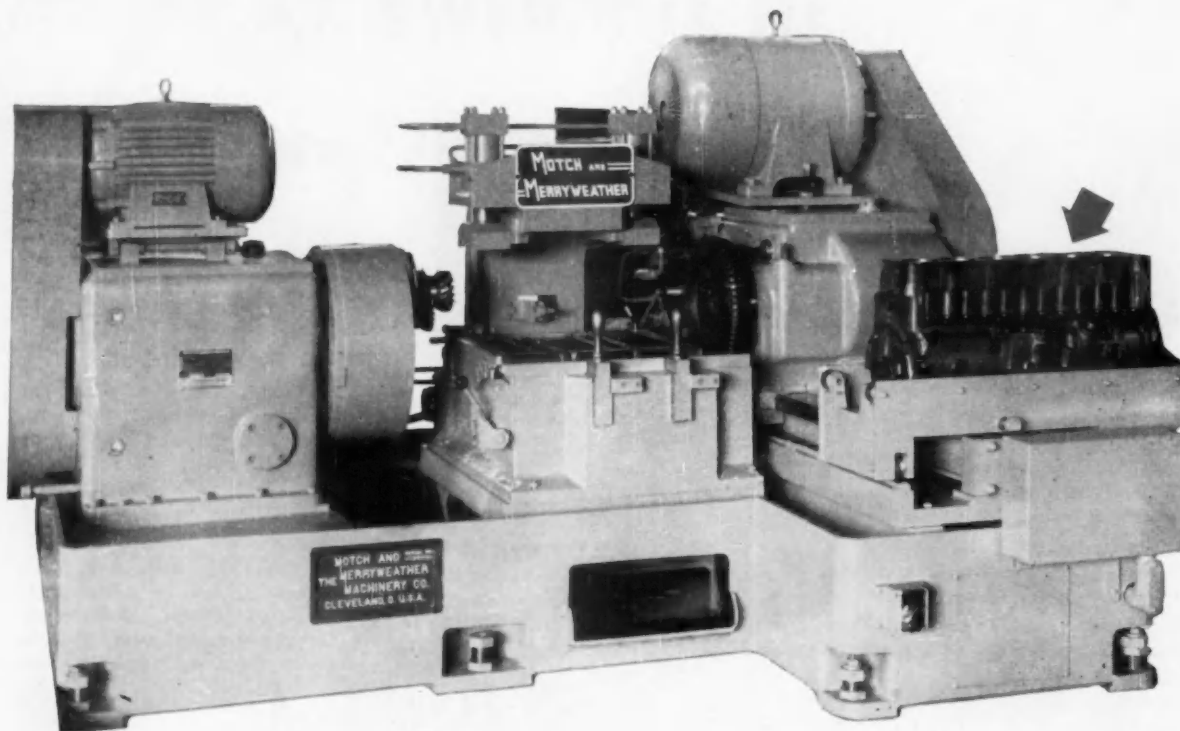


Olin Mathieson Chemical Corp.—George A. Waterman is now director of product sales and engineering for Olin Aluminum.

Huck Manufacturing Co.—Charles M. Albritton was named vice-president in charge of manufacturing.



M&M develops another specialized machine



Special Duplex Milling Machine

*more than doubles
milling production
on cylinder blocks*

A prominent automotive manufacturer—comparing this M&M machine with previous equipment used to mill ends of cylinder blocks—reports:

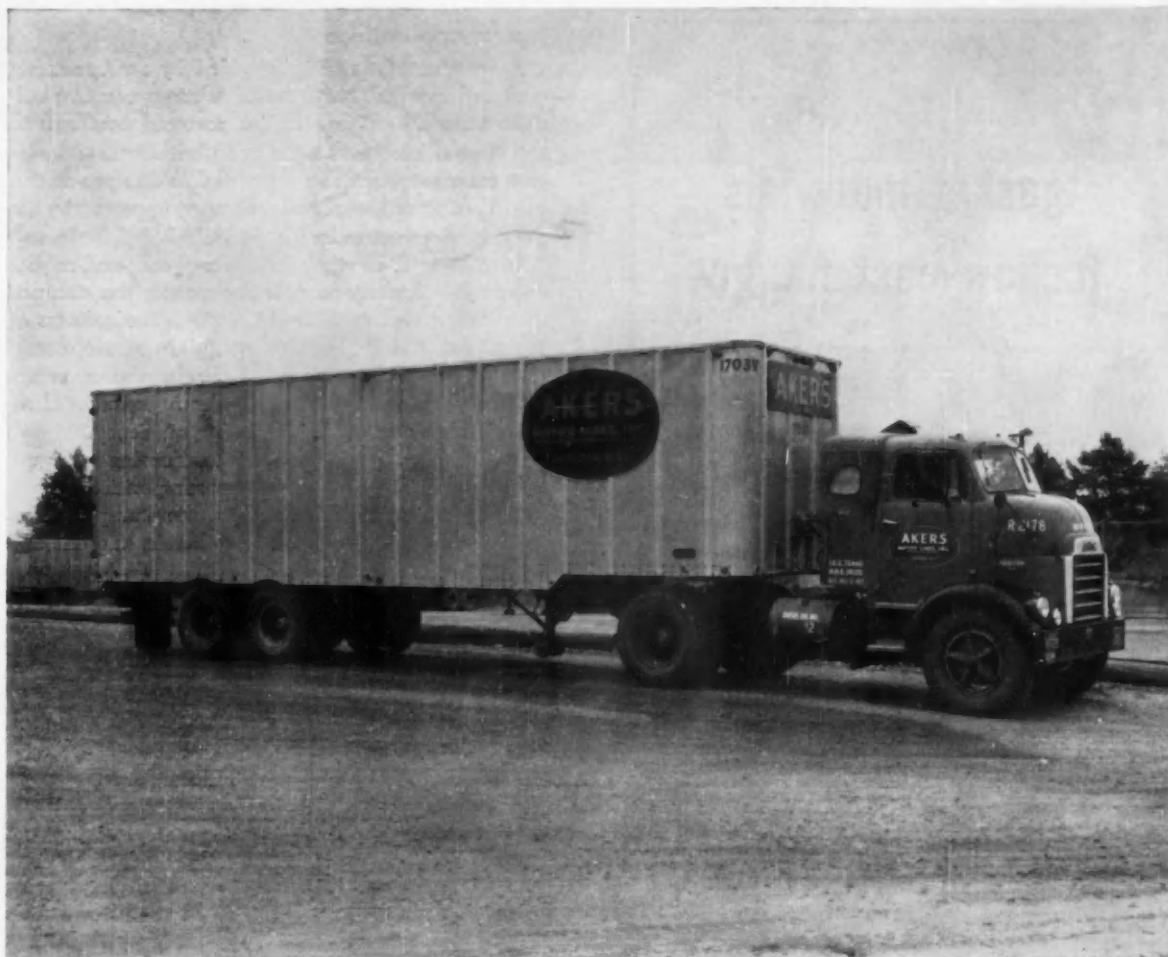
In addition to boosting production from 22 to 50 blocks per hour, this M&M machine has greater strength in planetary milling unit, gives longer cutter life and more accuracy. Its extreme rigidity permits rough and finish operations in one pass of the heads.

An operator positions the block in the fixture where it is automatically clamped. The right hand head feeds across one end of the block while the left hand planetary head profiles the flywheel housing mounting surface. Cutters rapid traverse back, fixture is unclamped and finished block is removed.

Machine Tool Manufacturing Division



Cleveland, Ohio



One of Akers' 40 new GMC DF-862 diesel powered units equipped with Fuller 10-speed R-96 ROADRANGER Transmission.

40 more FULLER ROADRANGER® *Transmissions added to Akers' fleet*

To Akers' original fleet of 10 GMC 860 tractors, 40 new GMC DF-862's are now being added...and *all 50* are equipped with Fuller 10-speed R-96 semi-automatic ROADRANGER Transmissions. Says William H. Tomlin, Assistant to the General Manager and Superintendent of Equipment, Akers Motor Lines, Inc., Gastonia, North Carolina: "We are very pleased with the service that the Fuller ROADRANGER Transmissions are giving us. They are a favorite with our drivers."

Fuller ROADRANGER Transmissions give Akers Motor Lines:

- Easier, quicker shifts—28% steps between ratios
- One shift lever controls all 10 forward and 2 reverse speeds
- No gear splitting—10 selective gear ratios are evenly and progressively spaced
- Engines operate in peak hp range with greater fuel economy
- Less driver fatigue—½ less shifting
- Range shifts pre-selected—automatic and synchronized
- Compact space-and-weight-saving economies—the most compact 10-speed transmission available
- Transmission weight under the cab—permitting more cargo to be carried on the payload axles

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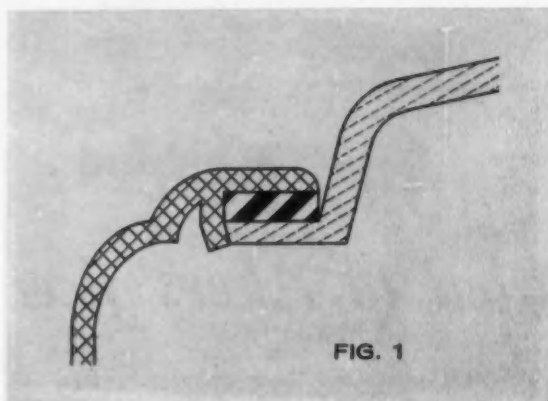
How to select gasket materials for low-cost flanges

Stamped, rough-finished cast, and other low-cost flanges require a gasket material that will seal irregular surfaces efficiently under the low bolting pressures usually available.

cork-and-rubber compositions

Such sealing jobs can usually be handled with truly compressible materials such as Armstrong cork-and-rubber compositions. These materials combine tiny cork particles in a continuous matrix of synthetic rubber. Varying the proportions of cork and rubber makes it possible to provide the right degree of compressibility for a wide variety of applications.

For extremely light assemblies, several Armstrong sponged cork-and-rubber materials with very high compressibility are available. When compressed to



the recommended deflection, these sponged materials are impervious.

solvent resistance

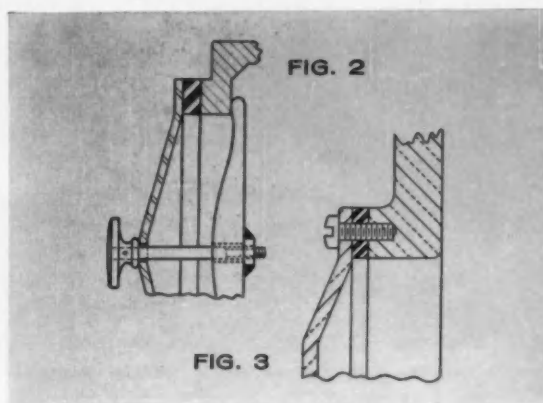
Cork-and-rubber materials generally have resistance to contained fluids comparable to that of straight synthetic rubbers of corresponding base polymers. Armstrong cork-and-rubber materials are available with nitrile-, styrene-, and chloroprene-type synthetic rubber binders. Two butyl compositions are also available. This group of synthetic binders makes it possible to seal a wide variety of fluids.

typical applications

A weathertight seal is provided by an Armstrong cork-and-sponged butyl gasket in an automotive tail-light assembly, Figure 1. The material conforms to the normal irregularities in the plastic lens and die-cast rim and provides a tight seal in this pre-assembled unit. Excellent ozone-resistance imparted by the butyl binder assures long service life.

In Figure 2, another Armstrong cork-and-rubber compound provides an effective seal for the stamped hand-hole cover on a diesel engine. The softness of the gasket permits economical light-pressure assembly. Frequent opening and closing of the cover are facilitated, because the cork-and-rubber material resists fatigue and retains its sealing efficiency.

In the waterproof electric motor housing in Figure 3, an Armstrong cork-and-rubber composition accommodates surface irregularities in the stamped cover yet stands up under exposure to lubricating oils and sea water.



Sealing cost-cutting flanges is only one of many sealing jobs Armstrong cork-and-rubber materials can handle efficiently and economically. Your Armstrong representative will be glad to give you information as to how these materials might be used in your particular applications.

SEND FOR 1957 EDITION OF "ARMSTRONG GASKET MATERIALS"

This 16-page booklet discusses the choice of proper gasket materials and describes Armstrong cork, cork-and-rubber, synthetic rubber, and fiber sheet materials. Look for this booklet in Sweet's product design file. For a personal copy, write Armstrong Cork Company, Industrial Division, 7111 Imperial Avenue, Lancaster, Penna.



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Only FRAM features the patented built-in gasket shown above. This FRAM patented design absolutely prevents by-passing of dirty air—initially and throughout its long life. It eliminates all of the defects found in other types of sealing—such as metal to metal, metal to cork or compound gaskets and metal beads pressed against a flat plastic face. Unless these types

of cartridges are replaced after servicing, in *exactly* the same position, they leak dust and dirt.

FRAM engineers designed the exclusive FRAM patented built-in gasket as an integral part of the end seal. It can never leak dirt-laden air—no matter how often it is serviced!

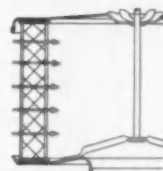
Add these other FRAM advantages: 99%+ efficiency, easy cartridge replacement and you'll know why FRAM *Filtronic* Carburetor Air Filter Cartridges are the finest on the market today; why nearly 50% of 1957 cars are equipped with FRAM—the air filter that obsoletes all other filter types.

FRAM Corp., Providence 16, R. I. • Fram Canada Ltd., Stratford Ont.

**Only FRAM can make
these statements!**



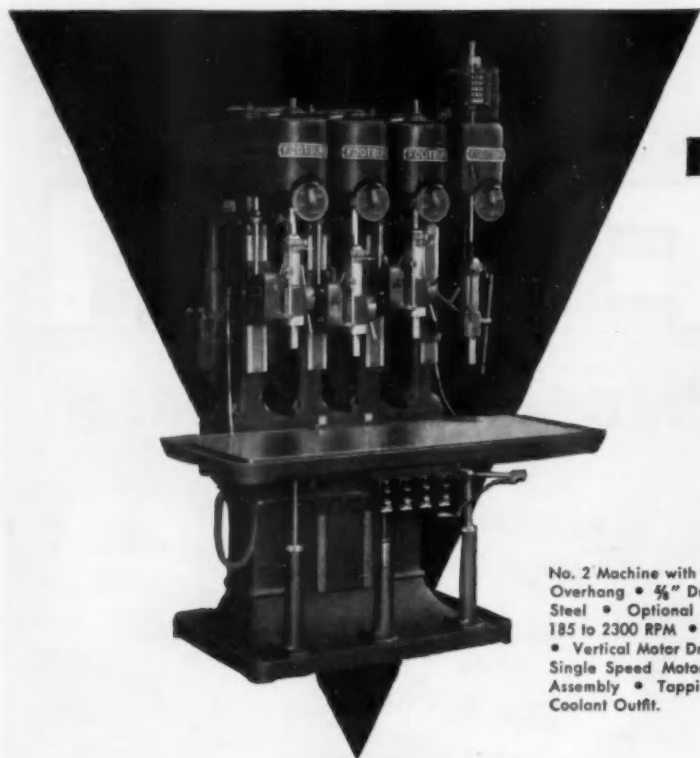
FRAM patented built-in gasket forms a perfect air-tight seal—no matter how often the cartridge is serviced, the unit is always perfectly sealed.



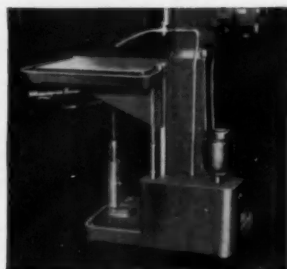
ALL air must pass through the filtering media. Once locked in place under slight pressure, this built-in gasket provides an absolute bond with the housing case.

**New FRAM FILTRONIC Carburetor Air Filter
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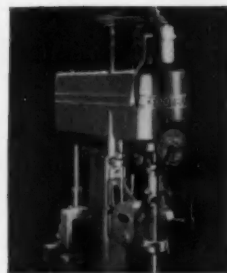
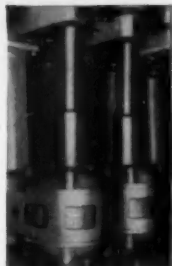
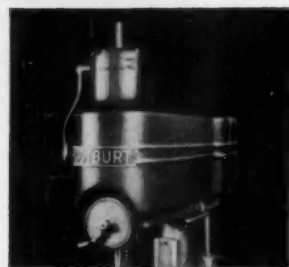
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for modern assembly lines

✓ **reduce costs**

If "one-at-a-time" rundown of nuts and bolts on your assembly line results in labor costs higher than you like to think about . . .

If your production schedules would benefit from increased speed and efficiency in multiple nut setting, bolt tightening, or similar operations . . .

If your product needs the quality control afforded by the simultaneous application of uniform torque to all nuts or bolts . . .

Why not call on Cleco, pioneer developers of modern, pneumatically powered multiple spindle assembly equipment?

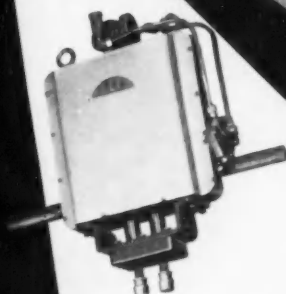
Cleco will custom engineer a multiple spindle unit for your specific application, whether you require a manually-controlled, semi-automatic, or automatic machine—whether your operation calls for 2 driving spindles or 24, or more.

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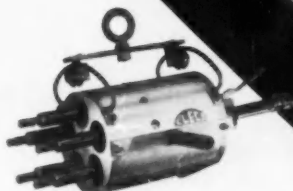
Illustrated are a few examples of the many custom-designed multiples Cleco has delivered. To get detailed information about what Cleco can do to speed production, improve quality control, and cut down costs for you, write Cleco Air Tools, P. O. Box 2119, Houston.

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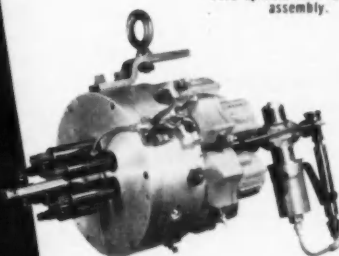
✓ **speed production**



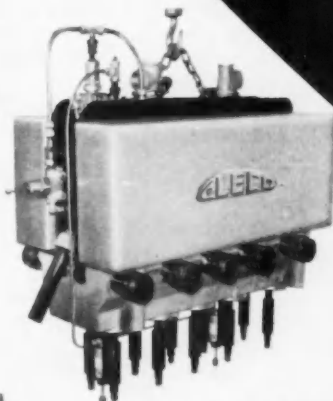
Two spindle nutsetter for automobile stabilizer bracket assembly.



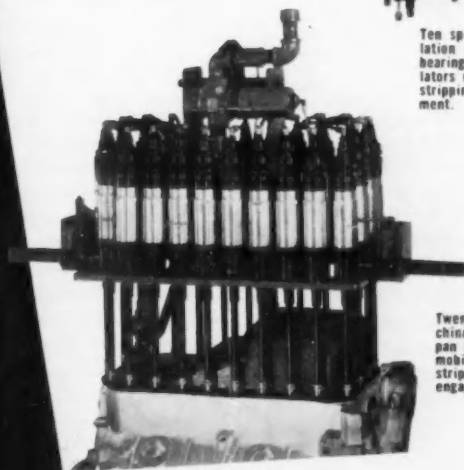
Five spindle unit for wheel assembly.



Six spindle nutsetter for assembly of flywheel to crankshaft. Close center distance made possible by driving spindles through offset gears. Unit has stripping rod for easy disengagement from the work.



Ten spindle unit for installation of V-8 engine main bearing caps. Has air regulators mounted in manifold, stripping rod for disengagement.



Twenty-four spindle machine shown setting oil pan bolts on V-8 automobile engine. Has stripping rods for disengagement.



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HOUSTON

Teamwork Among Stylists and Body Engineers

..... A MUST

Current
Body Engineering Problems
Discussed at
ASBE
12th Annual
Technical Convention
in Detroit

By James R. Custer

STYLISTS and body engineers must cooperate with great determination to produce an advanced passenger car design. The outcome depends upon the attitude with which they approach the problems. That was the theme of the paper presented by M. C. Patterson, Chrysler's Dodge Division president, to open the 12th Annual Technical Convention held in November at Detroit by the American Society of Body Engineers. Several hundred body engineers and designers attended the three-day convention. In addition to the six technical sessions, also featured were exhibits of 32 automotive suppliers. This dra-

matic display of their latest products attracted large crowds.

A new passenger car body design is bound to involve serious conflicts, Mr. Patterson pointed out, such as the viewpoints of the stylists, body engineers, safety engineers, performance engineers, and the sales department. Two attitudes meet head on—"it can't be done" and "there must be a way." How good and advanced a body becomes is dependent on the latter attitude.

Mr. Patterson reviewed the evolution of the 1957 Dodge body and cited examples of serious conflicts that had to be resolved.

Charles J. Griswold, Fisher Body senior project engineer, described the problems encountered in the development of another type of body—the Cadillac Eldorado Brougham, incorporating a new ultimate in automotive luxury and convenience. Limitations and freedoms in design resulted from the anticipated low production and high selling price. Major tooling requirements, such as large and complicated body panels, had to be kept to a minimum. Since this model was to represent the highest standard of engineering and was priced accordingly, the cost of individual components was secondary to their functional requirements.

In discussing the lowness of a car, R. A. Brown, Edsel chief stylist, warned that to go below a certain height where comfort is sacrificed for styling and aesthetic appearance could be hazardous to the safety and health of car occupants.

In his paper, "Fitting the Body to the Body," Dr. F. Gaynor Evans, associate professor of anatomy at the Wayne State University College of Medicine, cited the four-way seat as one of the most important engineering contributions.

The importance of body design and styling techniques in modern motor trucks was discussed by Theodore Ornas, Chief Engineer, styling section—advanced engineering group of the International Harvester Co., and by Willys P. Wagner, executive stylist, Ford truck exterior studio. Their papers gave some interesting observations.

Dennis A. Nankivell, Reynolds Metals Company engineer, presented an aluminum combination for production application in a car roof—aluminum die castings in the complex structures, aluminum extrusions in the simple beams, and aluminum sheet in the major roof panel.

"Urethane Foam in the Automotive Body" was the subject of the paper given by Dr. Calvin S. Yoran, vice-president and director of research, Brown Rubber Company Inc. In addition to the several current applications, he listed the following urethane potential applications—fully molded seats, headliners, foam back upholstery for sidewall door and truck liners, crash protection for rear seat drivers, rug underlays, rigid foam for heat and sound insulation, and weather seals for door and truck openings.

Fitting the Body to the Body

By Dr. F. Gaynor Evans
WAYNE STATE UNIVERSITY

As far as I am aware the amount of research done on the limits of tolerance of the human body with respect to automobile crashes has been almost completely limited to studies with anthropomorphic dummies. Such studies are valuable because a standardized dummy can be used and there is no standardized human. However, the behavior of the dummy is not the same as that of a living human body and the physical properties of the material of which the dummy is constructed are quite different from a human body which consists of skin, muscles, fat, connective tissues, bone, blood, nervous tissue, tissue fluids, cerebrospinal fluid, etc. In other words, the human body is far too complicated to duplicate in any dummy or model. There is no substitute for testing actual human material if you wish to determine its physical properties, limits of tolerance, etc.

The greatest weakness in the studies of some of the laboratories in which crash injury investigations are in progress is that the biological side of the problem is not represented. Attempting to study skull fracture by bouncing plastic head forms off a steel plate is a far cry from studying skull fracture in actual intact human

heads which are composed of various heterogeneous materials with different physical properties and biomechanical behavior when a force is applied to it. If automobile designers and safety engineers are really interested in determining the limits of tolerance of the human body more research by teams consisting of engineers, anatomists and surgeons is needed. This is the approach to the problem we have taken at Wayne. Much remains to be done.

Trucks— the stylish Stouts

By Willys P. Wagner
FORD MOTOR CO.

IT goes without saying that factors other than a vehicle's basic utility and appearance enter into the potential customer's consideration when he makes his selection. Driver comfort is certainly one of the more important things to be considered. After all, a truck driver may spend as much as six to eight hours behind the wheel each day. The cab is his home during most of his waking hours. The driver knows this; the owner knows it; and we obviously are deeply aware of it.

We have noted that the owner's investment in the truck he purchases is a major consideration. This is true not only of the vehicle's initial value in terms of its functionalism, but also

Die casting techniques were the basis of an informative presentation by L. B. Ragsdale, GMC Ternstedt staff engineer. The increasing use of zinc alloy and plastic dies for making prototype bodies was explained by W. J. Esdale, manager of the prototype division of Richard Brothers Die and Prototype Division, Allied Products Corp.

Analyzing the American car market, sales of 200,000 foreign cars were forecast for 1957 in the paper given by Serge Daniloff, president, Foreign Car Associates, Inc., Detroit. He stated that the time is very far away, if it ever will be reached, when European car sales will begin to approximate 10 per cent of the total car sales in this country.

Significant extracts from some of the papers follow:

of its resale value. And the resale value of a truck with modern and enduring styling is considerably higher than the resale value of a truck styled with only functionalism in mind.

Furthermore, if the truck has been advanced in its styling concept and has so stimulated pride of ownership that it has been well maintained, the vehicle obviously will command a higher resale price.

Further proof, if any is needed, of the fact that glamor is here to stay in trucks, is the acceptance of the Ranchero, an entirely new concept in light trucks with the beauty, comfort, speed and handling ease of a passenger car, and the utility of a ½-ton pick-up.

This highly styled addition to the pick-up line is a classic example of the always present necessity of achieving beauty through harmony of line and proportion, and with a minimum of both tooling and piece costs. The success of this venture was predicated at the start on the ability to meet a retail sales price objective, and the truck was styled in accordance with a very rigid set of specifications.

How Low Can We Go?

By R. A. Brown
FORD MOTOR CO. (EDSEL)

DESPITE accusations to the contrary, the stylist is not primarily inter-

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ested in converting all motorists into moles nor body engineers into frustrated height-problem solvers. The stylist is, or should be, concerned with aesthetic proportion tempered by human requirements and mechanical and economic feasibility. Even if good physical automotive proportions required an extensive lowering of today's vehicles, the stylist could not ignore the increasing height of the human inhabitant of that vehicle. Basically, the aesthetic proportions he desires to achieve should be secondary to both transportation and human needs. To simply force the evolutionary lowering of cars would be an admission of immaturity on the designer's part. . . . Our industry has achieved new heights in its self-awareness. Notice, if you will, the voluntary safety program it is conducting, and its recent de-emphasis of horsepower. This maturity must be matched by the stylist and designer if we are to fully discharge the duties entrusted to us.

Lowness, therefore, cannot be evolved, per se, but must be thought of as a proportionate quality. During the lowering evolution of today's vehicle, other things were happening. Cars became longer and wider—not all, but certainly some of the impetus to lengthen and widen the car was the disproportionate height of earlier years. Better proportion was sought by changing the ratio of length to height. Entwined with this, however, was the desire to cradle the ride on a longer wheelbase to achieve greater stability and riding comfort. The average height of today's automobile has thus been lowered, a better proportion achieved and riding comfort increased. Concurrently, however, other features have improved both stability and riding comfort, and it is fair to assume that future developments will continue this trend—developments not directly related to the aesthetic proportions which the stylist seeks.

Comfort and the lowness of the automobile are closely related. To a given point, a decrease in height has no effect on the physical position of the occupant, with the exception of entry and exit conditions. Reductions other than those dictated by aesthetic considerations can stem from mechanical innovations. But a minimum point is reached when the occupant is placed in an abnormal position—particularly the driver. Even if we, as designers, had the power to force the consumer into accepting a product which would

tend to eventually deform his body, a power we obviously lack, we are and have been morally bound to consider the price of such discomfort.

As comfort relates to safety so too does discomfort lead to deformity—temporary or permanent. It may appear to be stretching the point to make such a claim in reference to the automobile, but deformity encompasses a broader scope than the obvious misshapen body. More and more time is spent within the auto, and if the occupant must assume an uncomfortable position, the nervous system, blood vessels, lung cavities, and spinal contour might well be deformed—minutely at first to be sure.

Beautiful styling, at the sacrifice of sound engineering and utility, may sell to the consumer the first time, but he will not come back as a satisfied customer. Conversely, strict utility without regard to appearance, we have found also, does not make for satisfied customers.

**Evolution of
the Ultimate—
the
Eldorado Brougham**

Eldorado

**By C. J. Griswold, Jr.
FISHER BODY ENGINEERING**

THE outstanding innovation of the Eldorado Brougham body is the center opening doors. The design is the culmination of a trend which started with the two-door hardtop. This body style brought to the closed car the openness and sportiness of the convertible by providing an unbroken opening above the belt. The four-door hardtop added the convenience of the rear door. Entrance and exit was still conventional, however. The Brougham pillarless construction removed all obstructions from the entire door opening. The basic requirements of the design were as follows:

1. At the center opening when the doors are closed, the inner and outer edges of the doors are to meet with a gap no greater than that normally found between door and pillar.

2. Either door must swing to a full
(Turn to page 144, please)

ONE new model has been introduced to the GMC line, which ranges from half-ton units on up to highway tractors capable of hauling 90,000 lb gross combination weight. It is a package delivery chassis of 16,000 lb gross vehicle weight, and supplements the 7000 lb and 10,000 lb GVW package delivery models.

A new transmission, the Allison Torqmatic, has been placed in the new GMC models 370 and up through the 600, which cover weight ranges from 32,000 to 55,000 lb GCW. The Torqmatic, succeeding the Hydra-Matic for these models, is basically a torque converter in series with a planetary gear train operated through a hydraulic control system.

Manufactured by the Allison Division of General Motors, it has six forward speeds, and four forward driving ranges are provided to eliminate the need of reduction units or wide range axles, which previously were necessary with the Hydra-Matic transmissions for that weight class of trucks.

Output torque and speed are automatically adjusted by the torque converter to fit the requirements of the load and to get it under way. The hydraulic control system of the transmission automatically coordinates load, speed, grade and terrain, and selects the proper gear ratio at the exact time it is needed.

The four forward driving ranges, reverse and neutral positions are controlled by a selector lever in a floor-mounted control tower at the driver's finger tips.

The driver can reduce speed, without using the service brakes, by a hydraulic retarder. Controlled by a separate floor pedal, the retarder multiplies engine-braking up to six times the normal amount.

A power take-off opening is provided on each side of the Torqmatic transmission and no separate gear box is required. The power take-off is driven through the torque converter to give smooth power application, additional torque available to load demand and hy-

New Model Added to GMC Truck Line



1958 GMC pickup truck



New 336 cu in. V-8 engine available on light and medium duty GMC trucks

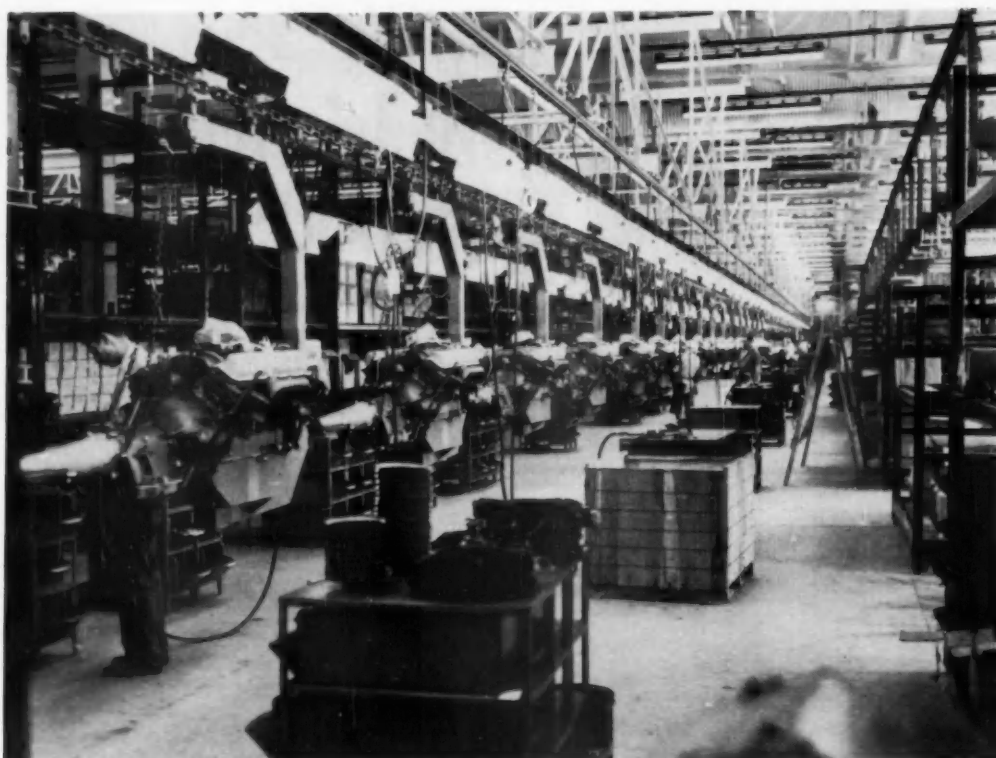
draulic cushioning for shock-free application.

A throttle over-control feature enables the driver to hold the transmission in one gear if desired by pushing the accelerator pedal to the floor. This keeps the transmission in the gear engaged at the time

unless truck speed decreases enough to require a downshift to maintain proper engine speed.

The Hydra-Matic transmission is retained on one-half through two-ton models.

A new GMC 336 cu in. V-8 gaso-
(Turn to page 160, please)



Engine dress-up line. Note the massive C-shaped carrier for handling the heavy powerplant.

Lincoln's New Plant for Unitized

By Joseph Geschelin

MORE than 20 years ago Lincoln launched the Lincoln-Zephyr car, the first make of that era to feature what is now called unitized body construction. Now the new Lincoln Division plant in Wixom, Mich., is manufacturing the first unitized body cars to be produced in the Ford Motor Co. family since the Lincoln-Zephyr.

It may be noted at this point that the entire concept of plant layout, body construction, and assembly procedures stems from the principle of unitized body construction. Obviously, this concept has resulted in facilities and methods which represent radical departures from conventional car assembly procedures.

This modern plant, located on Wixom Road in Wixom, Mich., has a floor space of 1,374,000 sq ft on a property area of some 325 acres. There is plenty of room for future expansion of any activity in any direction, and the plant buildings are so designed as to permit additions when needed.

Unitized body construction as developed by Lincoln features an enormous underbody structure of exceptional strength and rigidity, including the frame as an integral part of the structure. In the massive

framing fixtures the underbody serves as the backbone to which are integrated the front fenders, side panels, stub pillars for the doors, and the roof panel. The new body requires 3300 spot welds as compared with 2205 spot welds for the 1957 conventional body. Moreover, the heavier gage sheet metal reduces welding gun capacity from the usual 200 spots per minute to 40 spots per minute in many areas. Because of this Lincoln is employing 150-kva guns, said to be a first in this respect.

Naturally this design made it necessary to develop entirely new techniques for installing axles, front suspension, engine, exhaust system, etc. It entailed the design of an entirely new type of body carrier in conjunction with suspended assembly lines to permit the workers to perform assembly operation from underneath. To this end the conveyor system moves at a variety of levels for the convenience of operators at different stations.



End of the Lincoln final assembly line. Cars come to the end of the line from the background.

Body Construction

For convenience in handling the various functions the plant is divided into two major areas. The first floor contains body construction; body-in-white lines; cut-and-saw department; cushion department; body trim lines; final assembly lines; sub-assembly feeder lines; and car conditioning.

The second floor area is devoted entirely to paint operations on bodies and sheet metal to isolate this area of complex activity from the mechanical operations and final assembly on the first floor.

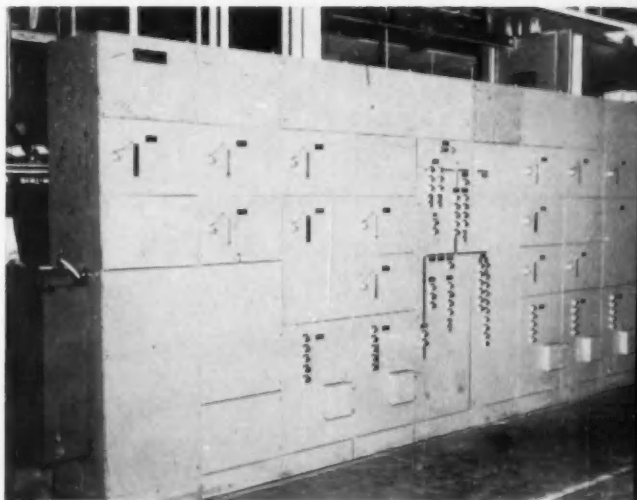
The plant in its present arrangement is designed for a capacity of 30 cars an hour. Scheduling of the complex setup is handled by punch cards, the information being transmitted to key areas by means of Teletypewriters.

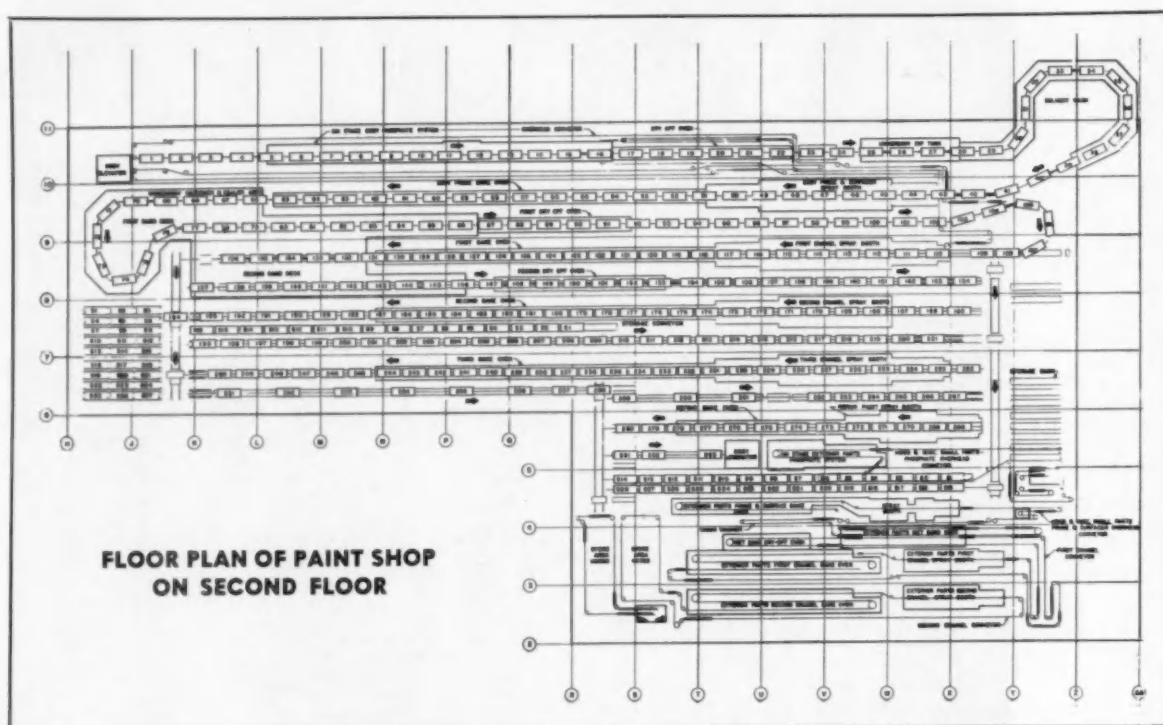
Consider now some of the highlights of the manufacturing operation. First major stage is the completion of the big underbody. This is done on a large 10-fixture merry-go-round line where the three major sections—underbody, floor pan and front end are welded into an integral unit. As these assemblies are completed they are loaded on a dual-chain conveyor for transport to the body bucks.

Nearby is another merry-go-round conveyor on which are assembled the complete body side panels. Body sides and roof panels join the underbodies on the conveyor line feeding to the body bucks.

Body framing is handled in a one-stage buck system, i.e., all of the preliminary welding required to

One of the Westinghouse power centers, one of many types and sizes found in the plant.





integrate the sheet metal and attachments, including the front fenders, is done while the various parts are air-clamped in one buck in a single setting. Basic body welding is handled in a group of

six of the large and massive body bucks.

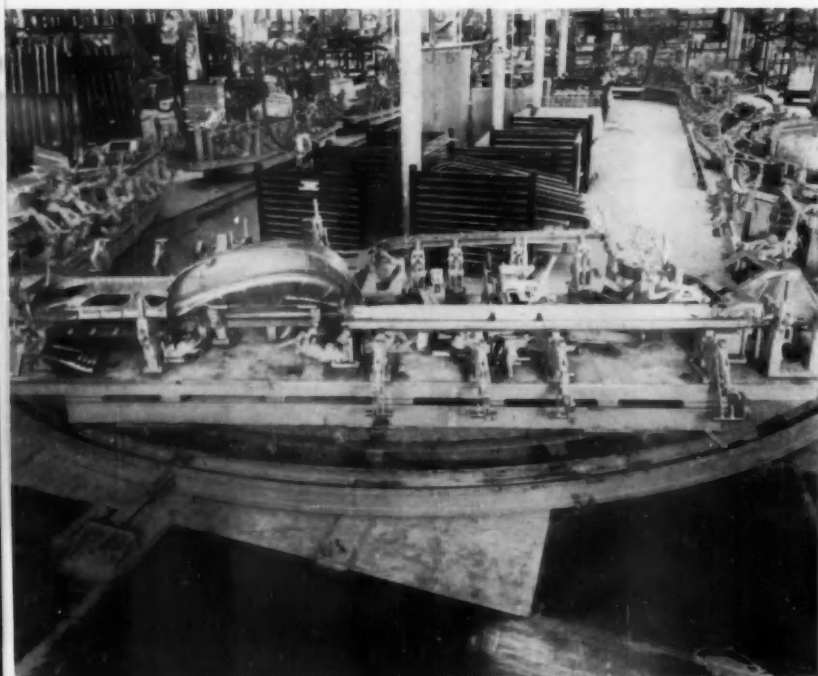
Incidentally, the constructional details are of such character as to require welding guns of special configurations in order to reach

many out of the way and hard-to-get at points. A number of the guns have extremely deep throats to reach into the structure and some are odd-shaped to clear obstructions.

Lincoln people have stressed the point that with their unitized body design the accuracy of sheet metal parts must be of a higher order than with conventional bodies. Not only are the stampings required to have close control of dimensions and size but their positioning and clamping the various fixtures must be held to closer tolerances. To further assure accuracy, Lincoln has provided a variety of gate fixtures for important openings such as the windshield, doors, backlight, and rear deck. These fixtures are clamped in place at the proper time to assure correct fitting before the final welding operations are completed.

Out of the bucks the body shell is placed on a skid carrier on the respot lines, then to the arc welding and gas welding booths. The new body requires considerably more arc welding than do conventional bodies. This operation is performed in a large Newcomb-

Perspective of the body side assembly merry-go-round. At maximum production it will complete 30 right- and left-hand panels an hour.



Detroit booth. Following welding the welds are ground and wire brushed to receive tin and solder. After soldering and finishing the doors and deck lid are installed and the body proceeds through a washer to remove filings, grease, and dirt.

Following metal finishing the bodies are ready for delivery to the second floor paint shop. They come to an automatic elevator on skids, then are attached to an overhead conveyor on which they traverse the paint shop. Skids are kicked off automatically, loaded on a conveyor for transport and reinstallation on the body later on.

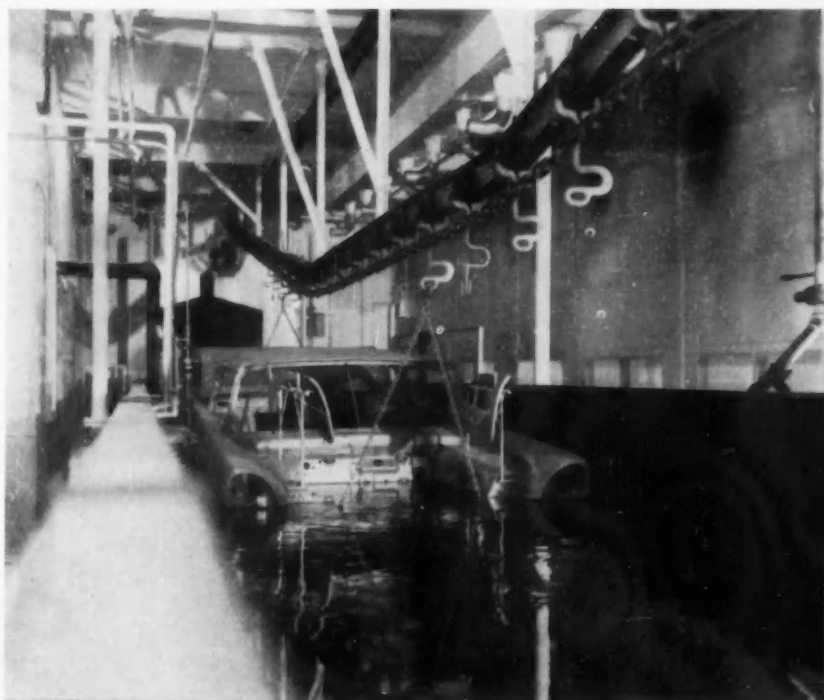
As shown in the floor plan, bodies come up to the second floor on the elevator at the upper left hand corner and proceed to the right. At the end of the paint shop schedule the bodies return to the first floor on the lowerator which may be seen at the intersection of bay 5-T. The first wet sand loop mentioned above may be seen at the upper left.

A gas-off operation provides a manual wash, then the body moves through a six-stage Newcomb-Detroit phosphate coating system 240 ft long. This is followed by passage through a Peters-Dalton dry-off oven 126-ft in length.

One of the unique features here is a prime dip tank in which the lower section of the entire body is immersed to provide permanent rust protection for the underbody as well as numerous box sections, inaccessible to paint spray operations. This dip tank holds about 8000 gallons of primer.

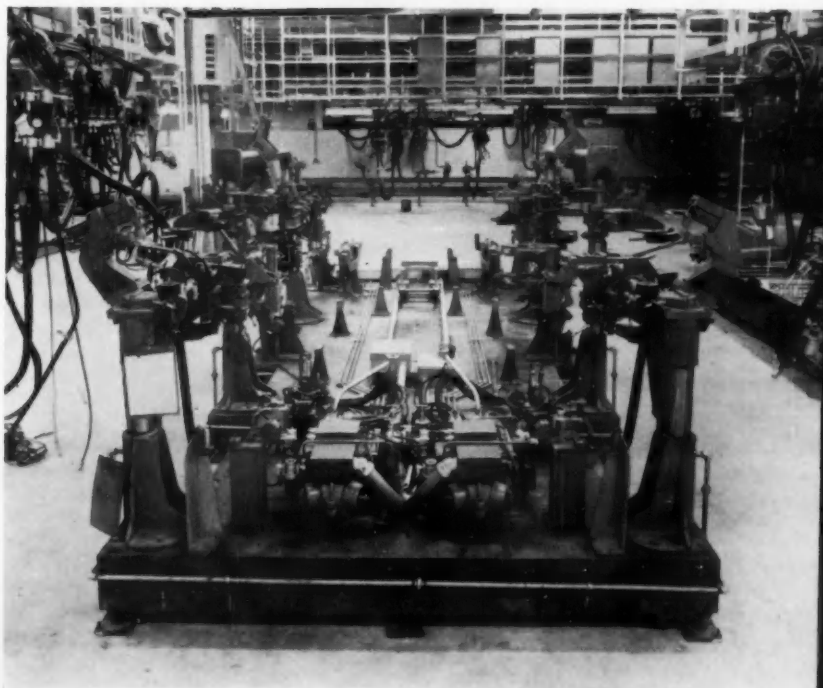
Bodies then go through a prime and surfacer spray booth, then a drying oven, and proceed to the first wet sand deck. On the way to the wet sand area, while suspended on the overhead conveyor, the underbody is sprayed with deadener. Wet sanding is handled on a circular loop of the conveyor, then the body goes through a blow-off and infra-red oven for drying. Vinyl sealers are applied before the body enters the main dry-off oven.

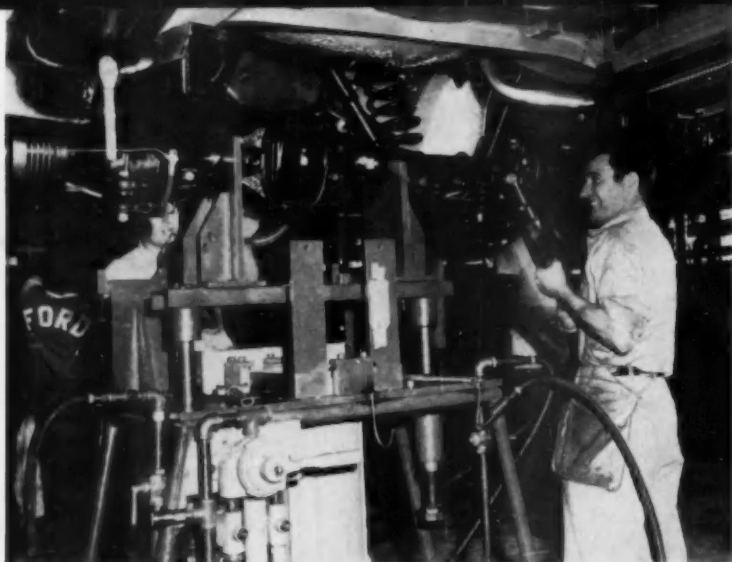
At this point the bodies are lowered onto skids and move on a conveyor through the tack-off vestibule, through the first enamel spray booth and into the first enamel oven. At the end of this bake, bodies go to the second wet sand deck and another drying oven. Fol-



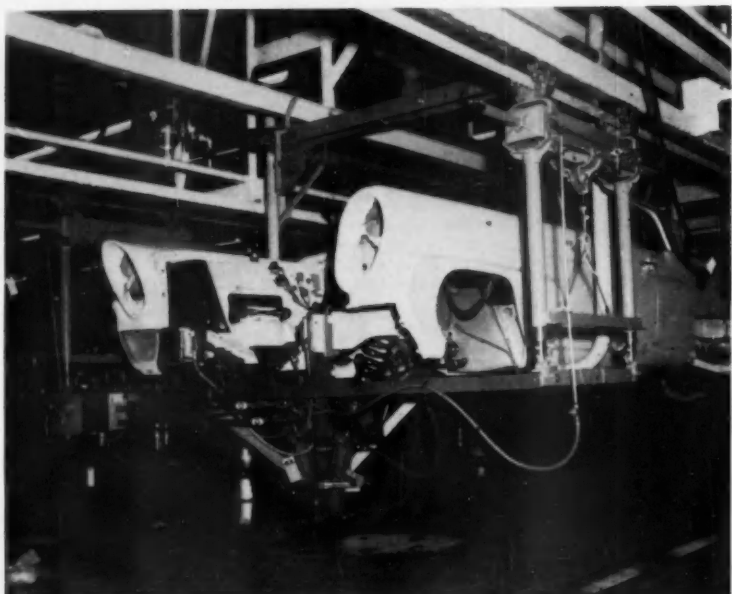
The prime coat dip tank operation in which the body is immersed to a depth of 28 in. Bodies are immersed one at a time as shown. The tank has a capacity of over 10,000 gallons of paint maintained at a constant temperature of 80 F to assure constant viscosity.

Close-up of one of the massive body bucks, showing the complex of clamps and welding guns.

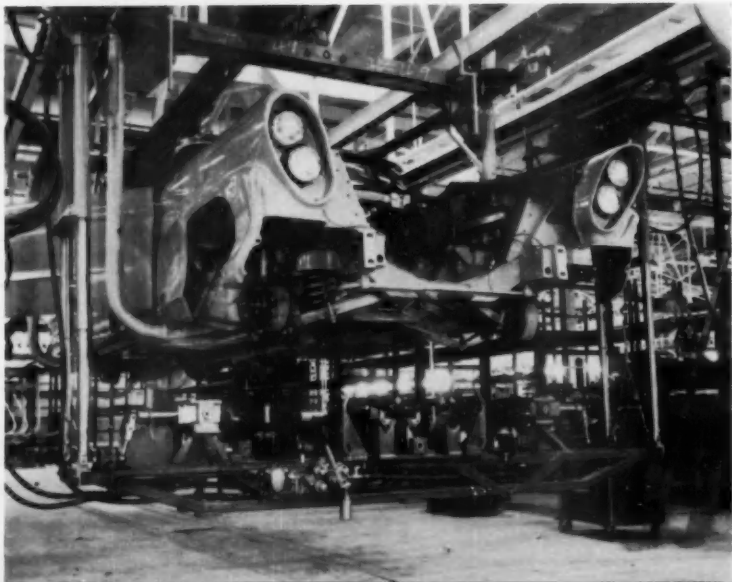




This view shows the built-in fixture along the suspended assembly line for raising the rear axle assembly into place.



In this view on the suspended assembly line is the fixture used to compress front coil springs for nesting in the front suspension. Operated by three men, it is employed for installing the upper and lower arms.



lowing a clean-up operation, bodies are masked for two-toning and go through the second enamel booth. Here the masking covers are removed and the body goes to the second enamel bake oven. If special two-toning is required, the body is sent through a third spray booth and oven.

Small parts painting is handled in a separate area of the paint shop, at the lower right of the layout, taking care of the variety of sheet metal elements such as all interior moldings, hoods, and exterior parts. Here, too, the first step is passage through a six-stage phosphate coating unit, some 162 ft in length, then a bake. Exterior parts go through a prime and surfacer spray booth, then a dry-off oven, wet sand deck and drying oven, and finally through a chain washer. All parts requiring color are put through two enamel spray booths and drying ovens.

Upon completion of the painting cycle and inspection bodies return to the first floor on an automatically operating lowerator and are stored selectively on the storage bank conveyor system. They are drawn from the bank according to schedule and fed to one of six trim lines. All inside hardware, body trim, headlining, glass molding, door hardware, etc., are installed here. Following water test bodies are moved to another conveyor bank which provides the selectivity for scheduling to the chassis department.

The centralized paint system is of recirculating type, originating in the central paint room and pumped throughout the plant continuously 24 hours a day. Tanks and pumps are used for color enamels, sealers, black parts paint, underbody primer, surfacer and primer. The central paint room has an impressive battery of DeVilbiss mixing tanks from which the various materials are pumped at a pressure of 30-psi through some 90,000 ft of paint piping.

In addition to the other painting facilities, there is also a black parts

LEFT—
Running gear units are installed to the body structure while it is suspended as seen here. This view shows the fixture for adjusting caster and camber.



Assembled bodies are shown making the loop on the overhead conveyor from the suspended assembly operations, directed at the left to meet the final assembly conveyor line.

paint system. Here the parts go through a 66-ft, three-stage phosphate coating system, a drying oven, side-draft spray booth or Flo-Coat booth, Flo-Coat dip enclosure, and an oven.

It is also noteworthy that the management is studying the economy of using electrostatic spray booths. Later on, if such equipment is justified for any of the painting operations, ample provision has been made for its installation.

After the body has been painted and trimmed, it is lifted in a special body carrying fixture, transported on an overhead conveyor system which signalizes the start of final assembly operations. Conveyor configuration in the vertical plane is designed to provide the right working elevations for the installation of the exhaust system, fuel and brake lines, front suspension, rear axle, driveshaft, and engine. The engine, incidentally, is installed from the top of the hood compartment. The conveyor continues until it reaches an overhead loop, then starts down the main

assembly line where other details are added while the body is still on the overhead conveyor. When the partly completed car reaches the wheel drop (on each side of the line) and the wheels are assembled, the overhead conveyor lowers to the level of the flat-top conveyor to permit the car to roll on its wheels. At this junction the body carrier fixture disengages automatically and moves away on the return conveyor.

From this point on the car assembly is completed in conventional fashion. This includes hood fitting, radiator assembly, installation of seats and bumpers, door adjusting, etc. At the end of the line the cars move onto toe-in rolls, then onto chassis dynamometers. Each car is given a road test on a circular track outside the assembly building.

As evidence of the enormous detail that went into the planning of this plant it is of interest that the layout contains 12,150 ft of 480-v, 3-pole, 400-amp bus duct with 30 power distribution panels. Another noteworthy feature is the provision

of 110 motor control centers—individual panel installations—at various points. Those for controlling the numerous automatically-operating conveyor systems were installed by Westinghouse.

One of the major activities is that of quality control, including receiving inspection. Departing from conventional practice, Lincoln designed its own inspection gages and had them ready before initial shipments of materials began to flow into the operation. Quality control also has suitable facilities for chemical and physical testing as well as special items of equipment such as Magnaflux.

Material handling is another of the major service activities. There is a battery of tow tractors and fork trucks, 19 of these being powered by liquid propane, others battery-operated.

Air operated power tools are employed exclusively. In all Lincoln uses about 1200 air tools of various types and sizes, including some five-spindle, multiple nut runners for attaching wheels on the assembly line.

Latest British Designs Displayed

THE 42nd International Motor Exhibition that closed in London on October 26 reflected the improved fortunes of the British automobile industry. It has now fully recovered from last winter's recession in production and sales caused by credit restrictions, labor and shipping difficulties, and gas rationing following the Suez crisis. Expected output this year of some 763,000 cars is not far short of the 1955 peak, while exports are estimated at a record 418,000, equaling 55 per cent of production.

Britain has regained from West Germany the

world's lead in vehicle exports, making substantial gains in most foreign markets. The United States was its number one customer during the first eight months of this year, with shipments reaching over 59,000 units, nearly three times the figure for the same period in 1956. While sales to Australia have slumped, those to South Africa, Canada, New Zealand, Sweden, Belgium, and other principal markets have increased considerably.

At Earls Court a record total of 310 cars were displayed by manufacturers from seven countries. This included 34 U. K. makes, 15 from America and Canada, 7 French, 3 Italian, 9 West German and 1 Czechoslovak. British car builders, who have never accepted the idea of an annual model change, are now tending increasingly to introduce new models at a time to suit their individual production programs rather to coincide with the October exhibition. The London show has thus become more an arena for public presentation of new and improved cars brought out during the previous 12 months than a stage for spectacular unveilings.

There were, however, several exceptions to this general practice. Rootes disclosed the station wagon version of its new Humber Hawk, powered by a 138-cu in. four-cylinder engine developing 78 hp at 4400 rpm. (Overdrive and automatic transmissions are available.) Like most European cars it is of integral body-frame construction, and features extensive use of rubber cushions in the suspension units to minimize road noise. A 110-in. wheelbase and 69.5-in. overall width provide adequate seating for six



Triumph Estate Wagon, designated as the Standard Ten in Britain, will be exported to America



The Vauxhall Cresta is powered by a six-cylinder 82-hp engine

at London International Motor Show

By
DAVID SCOTT

Lotus Elite with all-independent suspension and disk brakes uses glass fiber reinforced plastic in the integral body-frame construction



adults, while the maximum cargo capacity is 56 cu ft.

The British trend towards wagons was followed further by Rootes with the smaller Singer Gazelle, which shares most body and chassis parts with the Hillman Minx and Sunbeam Rapier made by the same group. This four-door model has a split tailgate and can carry up to 700 lb of cargo. It incorporates the same styling changes of the latest Singer sedan and convertible, which cover frontal treatment and dual color schemes. All three are powered by a 91.5-cu in. overhead camshaft engine rated at 52.5 hp at 4500 rpm. The gearbox has four forward speeds, and overdrive is offered as an optional extra.

With its Ensign sedan, Standard moves away from the modest horsepower race in Britain. This uses the basic body shell of the Vanguard, but with a small-bore version of the same four-cylinder sleeved en-

gine. Capacity is reduced from 127.5 to 100.2 cu in., although the output of 60 hp at 4000 rpm is only 8 hp less. A four-speed gearbox with stick shift, similar to that in the Triumphs sports car, permits maximum utilization of the power.

The Standard Ten has been given a major facelift to provide the Pennant, which has new styling for the front and rear fenders and the trunk. Overdrive is available on the 37-hp engine. The company has just launched its "Ten" in America, designating these small cars as the Triumph Sedan and Estate Wagon, cashing in on the success and name of the Triumph TR3. It was disclosed that 5500 of these sports cars were sold in the U. S. during the first nine months of this year.

The Vauxhall Velox and Cresta were prominently displayed in London. These 82-hp sedans are now in full production at the new General Motors plant at Luton, England. Tapping the growing home-on-wheels market, Vaux-
(Turn to page 134, please)



Restyled Singer Gazelle which is offered as a station wagon as well as a sedan and a convertible



1958 Cadillac Coupe de Ville

Cadillac Has All Coil Type Chassis Springs

New Linkage Provides for Interchangeability of Springs and Air Suspension Units

THE 1958 Cadillac appears in four series of cars: three standard series (60, 62 and 75) which feature 11 body styles and one custom series (Eldorado Brougham) with one body style.

The models by series are: **60 Series**—Fleetwood 60 Special Sedan. **62 Series**—Coupe, Sedan, Extended Deck Sedan, Coupe de Ville, Sedan de Ville, Convertible, Eldorado Biarritz Convertible, and Eldorado Seville Coupe. **75 Series**—Eight-Passenger Limousine, Eight-Passenger Sedan. **Custom Series**—Eldorado Brougham.

One new model, the Series 62 Extended Deck Sedan, is added to the 1958 line. The body is the same as the Sedan de Ville with differences being in interior trims and standard equipment.

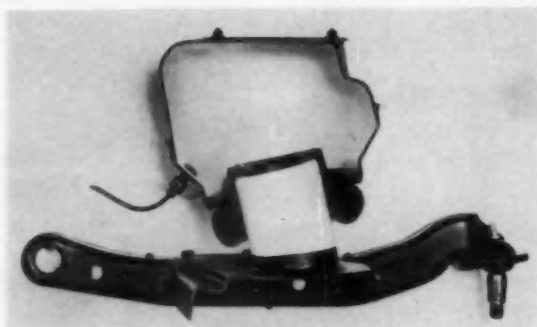
Over-all length of all models is increased 0.9 in. with no change in wheelbases. Wheelbases for the three standard series are: 60, 133 in.; 62, 129.5; 75, 147.5.

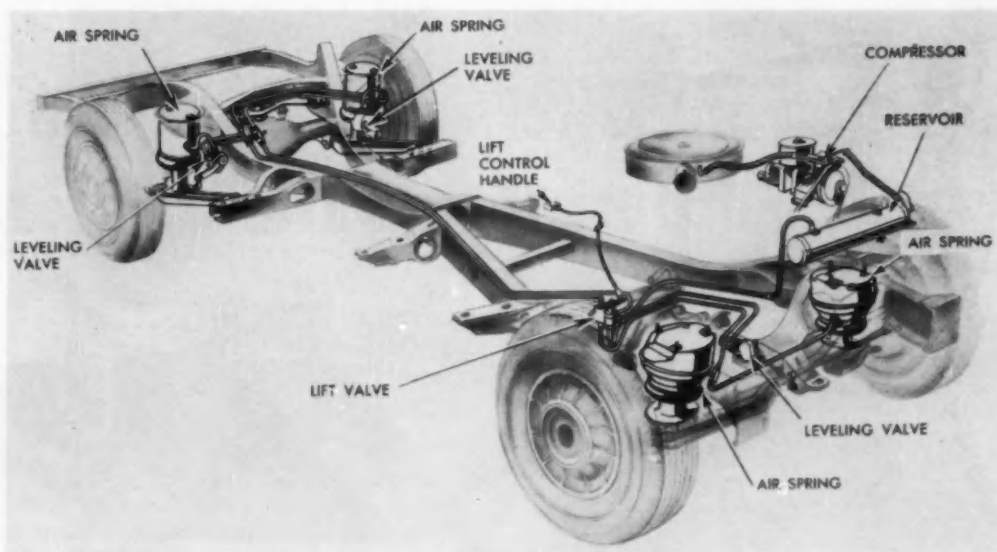
Four-link rear suspension—pio-

neered on the Eldorado Brougham—is standard equipment throughout the line. It features a high roll center (5.88 in. higher than 1957) which is said to result in better cornering and increased stability. To go with this linkage in 1958 are coil springs which are readily interchangeable with air springs of the optional air suspension system. This system is optional in the entire line excepting

the Brougham where it remains standard. The system includes a constant leveling feature so that the car always is at the same height regardless of road or load conditions. Another feature of the system is a lift valve. By pulling a lift control handle near the steering column the driver raises his car an additional five inches for traversing steep ramps or driveways.

Cutaway front air spring





Cadillac chassis with air suspension

Engine displacement is 365 cu in. (4 in. bore, $3\frac{3}{8}$ in. stroke) as in 1957. Compression is increased to 10:25 to 1 from 10:0 to 1. A new camshaft is used which provides improved fuel economy and idle.

Larger valves, located on increased center distance, are used along with the redesigned combustion chamber, part of which is a depression in the head of the piston.

In 1958 Cadillac again has two

engines: a standard version rated at 310 hp at 4800 rpm and a "Q" engine which features three two-barrel carburetors and develops 335 hp at 4800 rpm. Torque on both engines is 405 lb ft at 3100 and 3400 rpm respectively.

Four headlamps are standard on all cars. The outer lamps, with both high and low beams, are for city driving. On the low beam there is greater wattage than with a conventional two-lamp system, with the resultant greater illumi-

nation which is aimed more carefully to provide light in the area on the right side and shoulder of the highway or roadway.

The high beam of the outer lamps provides soft general lighting and is used in conjunction with the single high beam of the inner lamps for so-called country or open highway driving. This high beam from the inner lamps also has more wattage than present day two-lamp systems and provides a bright spotlight effect.

New Chrysler Cars Will Have High Boil Point Brake Fluid

All Chrysler Corp. cars and trucks in 1958 will use a new brake fluid called "Hi-Temp" designed for heavy-duty braking and heat resistance. The fluid has a minimum boiling point of 390 degrees F, which is nearly 100 degrees above the SAE current specifications for heavy-duty fluid. Chrysler engineers claim the fluid will tend to lessen the danger of brake fade or failure.

Hertz Spending \$60 Million For 19,737 New Model Cars

Hertz Rent-A-Car System, Inc., is taking delivery on 19,737 new cars and plans another big order after next April 1, when the current orders are filled. The Hertz purchase, total-

ing more than \$60 million, includes Chevrolet, Plymouth, Ford, Oldsmobile, Buick, Cadillac, Pontiac, and Edsel cars.

At the start of 1958, Hertz expects to have some 30,000 cars in operation, or 5000 more than at the beginning of this year. The April order of 11,000 cars will total \$33.5 million.

The current order includes 75 per cent four-door hardtop sedans with power brakes, power steering, radio and heater. Twenty per cent of the cars ordered are convertibles and sport cars, and five per cent are station wagons.

GM President Forecasts Record Production for Opel, Vauxhall

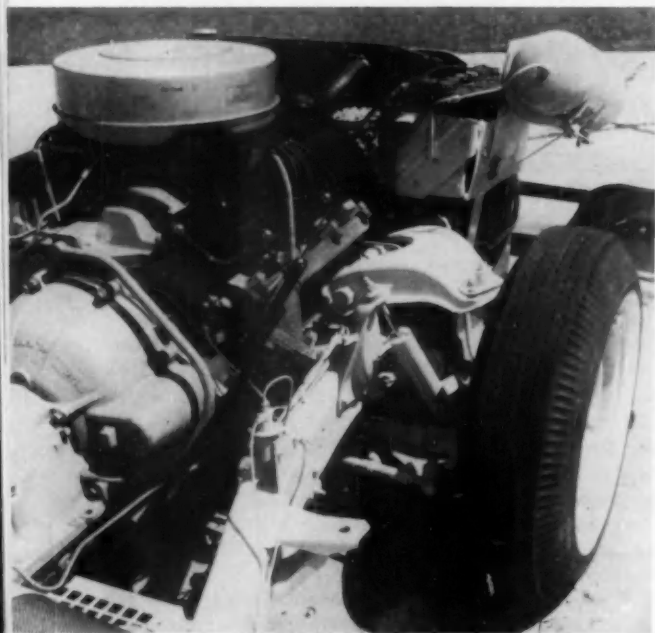
General Motors President Harlow H. Curtice has announced record production for 1957 at both the Adam

Opel plant at Russelsheim, West Germany and the Vauxhall factory at Luton, England. At Opel, production for 1957 will total 231,000 passenger cars, trucks and vans, he said, or some 10 per cent above 1956 output. Vauxhall production will reach 160,000 units this year, or 32,000 more vehicles than last year.

Regarding the growing automobile industry in West Germany, he predicted a total production of 1.2 million vehicles for 1957. This would be about 34 per cent of all West European output. And speaking at Luton, he said that the Vauxhall plant recently completed a \$101 million expansion program begun in 1954 which will allow production of 250,000 units annually.

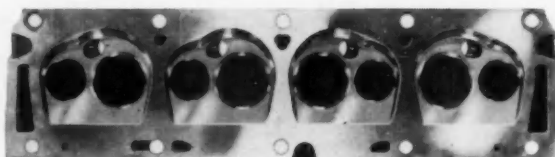
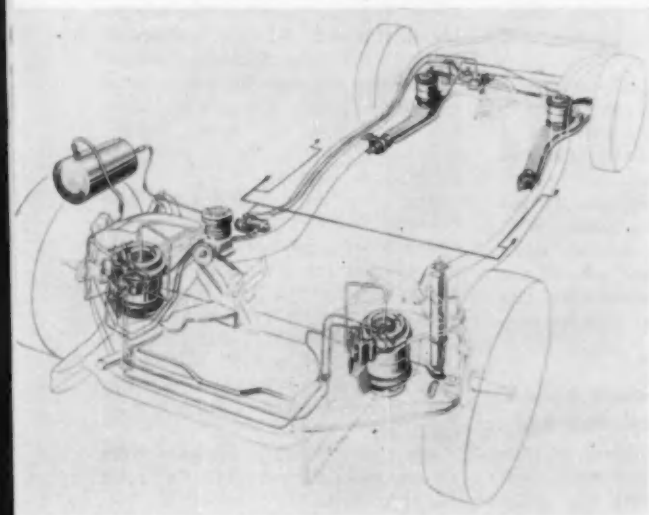
Mr. Curtice recently returned from an inspection tour of GM's European facilities.

Ford Offers Air Suspension and Dual Range Transmission



Right front end of the chassis showing air suspension, reservoir tank, and, to the left of the battery, top of the air compressor

This phantom view shows arrangement of air suspension components



Cylinder head has machined, wedge-type combustion chambers

A FRESH styling theme, a new series of larger displacement V-8 engines, a dual-range automatic transmission, and a luxury ride air suspension system are among the many features that highlight the offerings of the Ford Division for 1958.

Ford cars are available in four series and a line of station wagons with a variety of body styles. The Fairlane and Fairlane 500 are mounted on 118-in. wheelbase, the other models on 116-in. wheelbase. The line-up of models is as follows: *Custom*—Tudor Sedan, Fordor Sedan, Business Sedan; *Custom 300*—Tudor Sedan, Fordor Sedan; *Fairlane*—Club Sedan (2 door—thin pillar), Town Sedan (4-door—thin pillar), Club Victoria (2 door—pillarless), Town Victoria (4 door—pillarless); *Fairlane 500*—Club Sedan (2 door—thin pillar), Town Sedan (4 door—thin pillar), Club Victoria (2 door—pillarless), Town Victoria (4 door—pillarless), Sunliner (2 door convertible), Skyliner (2 door retractable hardtop); *Station Wagons*—Ranch Wagon (2 door—6 passenger), Del Rio Ranch Wagon (2 door—6 passenger), Country Sedan (4 door—6 passenger), Country Sedan (4 door—9 passenger), Country Squire (4 door—9 passenger).

The Ford Skyliner (retractable hardtop) has an all-steel body with a steel roof that may be retracted into the luggage compartment. To effect this the body is about 3 in. longer than corresponding models. Seven electric motors power the system, actuating self-locking screws having either a rotating nut or a rotating screw, depending upon the application.

Two new OHV, V-8 engines of advanced design—332-cu in. and 352-cu in. displacement—have been added to the line of powerplants, making available the family of five basic engines outlined in the engine table. The new engines offer improvements ranging from higher performance to greater life and easier servicing.

Among the basic improvements are the machined



**Fairlane 500
Town Victoria; all
models have dual
headlamps**

wedge-type combustion chambers in the cylinder heads. Machining implies closer control of combustion chamber volume as well as smoothness of surface to discourage the build-up of deposits. Valve port arrangement is such that no two exhaust valves are adjacent. Moreover, the 18-mm self-cleaning spark plugs now are located above the exhaust manifold and are inclined for best flame propagation. These plugs have a projecting insulator that places the electrodes farther into the combustion chamber, resulting in shorter flame travel and more uniform burning.

The keystone-shaped intake manifold has larger, direct passages of nearly equal length to all cylinders. It adds structural rigidity to the engine assembly, eliminates a separate valve tappet chamber cover, and forms a part of the seat for the valve rocker cover.

The valve train system is simpler, lighter and more accessible. Heavier valve springs minimize valve spring float. Valve rotators of Ford design are employed on both intake and exhaust valves. Exhaust valves precision-molded of high alloy steel are continued. Integral valve guides also are continued.

Exhaust manifolds are designed to provide greater engine accessibility. A labyrinth in the right-hand manifold provides heated air for automatic choke operation. The exhaust systems have less back pressure, large Y-type inlet pipes on V-8's, and larger mufflers on all models except the Sunliner and Skyliner. The latter models have resonators when dual exhaust systems are employed. Mufflers have double-wall construction while the heads and inner shells of all mufflers are zinc-coated to resist corrosion.

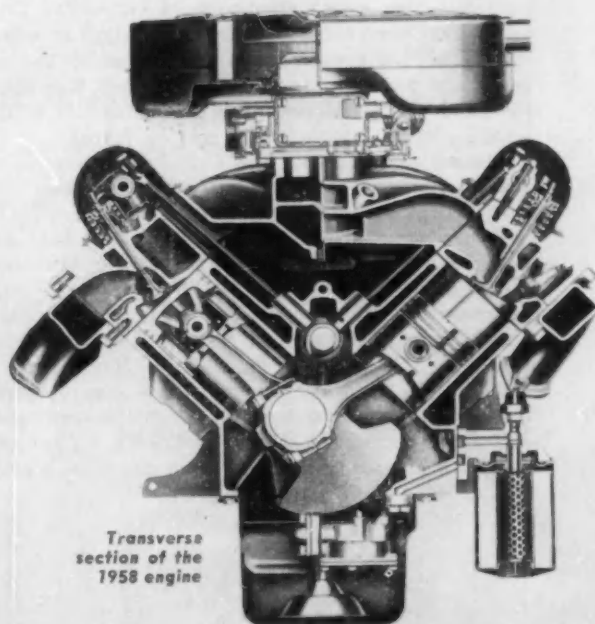
The engine front cover is stamped from light gage sheet metal. This is made possible by the use of a new high capacity water pump mounted at the top front center of the cylinder block. The oil pump has been moved to the inside of the oil pan. The inertia member of the crankshaft damper assembly now is a

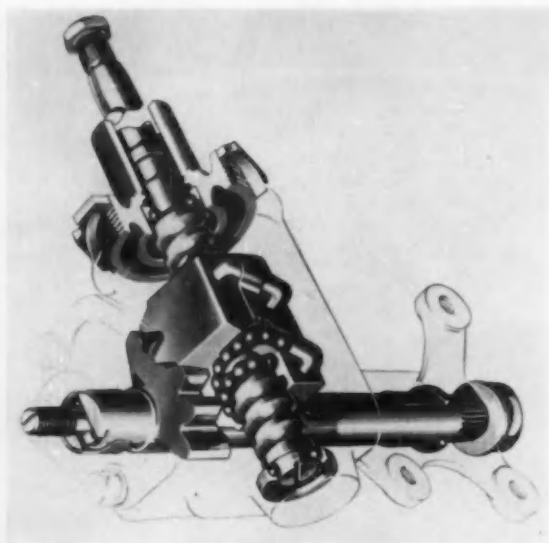
**TABLE I
Condensed Engine Specifications**

Engine Disp.	223	292	332	332	352
Type	OV 16H	OHV V8	OHV V8	OHV V8	OHV V8
Carburetor	1V	2V	2V	4V	4V
Comp. Ratio	8.6	9.1	9.5	9.5	10.2
Bore	3.82	3.75	4.00	4.00	4.00
Stroke	3.60	3.30	3.30	3.30	3.50
Horsepower	145 @ 4200	205 @ 4500	240 @ 4600	285 @ 4600	300 @ 4600
Torque	212 @ 2100	285 @ 2400	340 @ 2400	380 @ 2800	395 @ 2500

**TABLE II
Series Availability**

Transmission	Conventional	Overdrive*	Ford-O-Matic	Dual-Range
6 Cyl 223-1V Single Exh	All Models Except Sunliner & Skyliner			NA
6 Cyl 292-2V Single Exh	Custom & Custom 300			NA
6 Cyl 332-2V Single Exh	Fairlane & Station Wagon			NA
6 Cyl 332-4V Single Exh	Fairlane 500			Fairlane Fairlane 500 Station Wagon
6 Cyl 332-4V Dual Exh	Custom & Custom 300			
6 Cyl 352-4V Dual Exh	All Except Custom & Custom 300			





New recirculating ball type steering gear

stamping of larger diameter than the former cast iron member.

The precision-molded crankshaft has been strengthened at vital points and has considerably more journal overlap for added strength and rigidity.

For 1958 Ford offers a wide range of transmission options including the synchromesh three-speed unit, overdrive transmission, an improved version of the Fordomatic, and the new Dual-Range automatic transmission. Externally, the latter unit appears the same as Fordomatic. However, it contains a redesigned valve box to handle the additional drive range, and a new sprag-type one-way clutch to provide a smooth first-to-second upshift. This smoothness is further enhanced by the introduction of a new front band servo assembly which includes a hydraulic accumulator to cushion front band application.

Dual-Range also has a two-stage governor for smoother, closed throttle 3-2 downshifts, and a welded steel converter which eliminates 14 bolts. The fast-acting rear band servo is of two-piston type in which modulated line pressure first is directed to the accumulator piston to take up the linkage and apply the band. Then full line pressure is directed to the second piston to provide the holding force.

The major feature of the Dual-Range drive is in the selection of three forward speed ranges. The shift selection has the following options: Park (P) position; Reverse (R); Neutral (N); D-2; D-1; and Low (L). In operation, D-1 is the high performance range in which starts are made from first gear with progressive shifts into direct. When in this range, under closed throttle deceleration, the transmission will downshift directly from third to first between 7 and 10 mph. While operating in third gear at speeds between 26 and 60 mph a full throttle detent downshifts the transmission to second gear. Under this condition at speeds below 26 mph the transmission would shift to first gear, a 3-1 shift.

When the selector is placed in the D-2 position, the transmission always starts in second and shifts to direct drive between 15 and 65 mph, depending upon throttle position. While in this range the transmission cannot be downshifted into first gear.

The Low position places the transmission in first gear where it remains until the selection is changed. This is the ideal position for maximum engine braking on steep grades or for extra pulling power.

The combinations of engines and transmissions available are outlined in Table 2.

From the standpoint of the chassis, important changes have been made in steering and suspension. A new Ford-built recirculating ball-and-nut type steering gear is standard. It has an overall ratio of 27 to 1.

Ride and handling are improved through the adoption of a threaded steel bushing in the front suspension upper control arm. The bushing is lubricated for life.

The Ford-Aire suspension is made available as an option on all Ford Fairlane and Station Wagon models. The air supply system consists of an air compressor, an air pressure reserve tank, and air lines. The compressor, of piston type, has a capacity of 850-cu in., and supplies air at a pressure of 300-psi. It is mounted on the engine and lubricated from the oil system of the engine. The reserve tank, which has a capacity of 400-cu in., is mounted under the right front fender.

The leveling control system is arranged for rapid leveling when load changes take place and slower corrective leveling under all other conditions. It consists of two front and one rear leveling valves, a solenoid, and door courtesy light switches. The quick leveling system is operated by the door courtesy light switches. Opening of any door energizes the solenoid for this function. When doors are closed, filling or exhausting of air springs takes place more slowly.

The air suspension system will have specially calibrated shock absorbers of the same type as those used on the standard suspension.

With air suspension, the front suspension arrangement remains substantially the same since the air spring replaces the coil spring. However, the shock absorbers are located outboard where they require about half the resistance needed in the usual location. Air pressure is approximately 120 psi in the front air springs.

The design of the air dome embodies a special pedestal which provides a pressure area that is varied automatically in accordance with requirements. The area is larger when the pedestal is pushed into the dome by a bump; smaller when the pedestal is moved downward as a wheel sinks into a depression.

The rear suspension is entirely different to accommodate the air springs. Here the air springs are mounted on the trailing arm ahead of the axles, between the arm and the side rail. Trailing arms take care of guiding the axle and wheels for vertical and roll movement while the rear axle is positioned laterally by means of a track bar. Air pressure in the rear springs is about 75 psi.

40 Countries

represented at

World Metallurgical Congress

By Kenneth Rose

WITH an attendance at the exposition estimated by show officials at 65,000, and perhaps 3000 to 4000 scientists at the daily presentation of technical papers, the 39th Metal Congress and Exposition, and the Second World Metallurgical Congress held record-breaking sessions in Chicago Nov. 2-8. The congress was sponsored by the American Society for Metals, with American Institute of Mining, Metallurgical, and Petroleum Engineers, Special Libraries Association, Industrial Heating Equipment Association, Society for Nondestructive Testing, and Metal Powder Association cooperating.

Developments in metal technology described in the more than 170 technical papers presented at the meetings outlined recent research, and other papers estimated the direction of future trends in study and application. A few papers sounded warnings of

deficiencies in educational programs, and of waste of resources. Papers of broad significance were especially to be noticed among those at the international meetings, where visitors from about 40 countries were in attendance. Eleven of the more than 500 persons attending the World Metallurgical Congress were from the U.S.S.R., one of the few occasions upon which scientists from that country have attended technical sessions outside their own land.

Metallurgists and engineers heard discussions of new or recently announced techniques for metal fabrication, including new tools. Chemical milling, in which metal is removed from a workpiece by controlled etching with a chemical, is being extended in its application from aluminum, with an alkali etchant, to such resistant metals as titanium and stainless steel. This technique finds its greatest use in the aircraft industry. Another aircraft industry technique is the use of metal light-core laminates, or sandwiches, originally made with organic binders to bond the laminations, now tending toward ceramic binders and stainless steel or titanium facing sheets for high temperature resistance.

Aluminum oxide tools, familiarly called ceramic tool bits, have some disadvantages that may prevent their broad acceptance in metal cutting. However, they will remain in the picture both for their general advantages and as possible emergency replacements for cemented carbides or tool steels if a scarcity of such metals as tungsten should occur, it was stated. Automation may provide, through power requirement measurements, for giving warning of the dulling of a cutting tool.

The possibility of increasing cutting speed greatly by reducing the temperature of the workpiece to below zero was mentioned. Such low temperatures greatly increase the brittleness of most metals. A combination of electrolytic etching and abrasive cutting, in which an abrasive charged metal cutting wheel is given one charge and the metal to be cut is

(Turn to page 106, please)

More Emphasis on Science

SPEAKING at the Metals Awards Luncheon of A.S.M., Joel Hunter, president of Crucible Steel Co. of America, called for the development of knowledge with understanding to produce a "larger perspective" of the meaning of science "to ourselves and to other people." Knowledge without understanding is little more than a memory, he said—such as a parrot or an electronic machine could be programmed to give in response to predetermined stimuli. Understanding is the quality that distinguishes man from both beast and mechanical contrivance.

Basic research supplies the accumulation of knowledge from which our technology is drawn, and so is important to all industry. The scientist is becoming increasingly a part of the production team, he said. The steel industry is recognizing that spending money on a research project may produce an increase in produc-

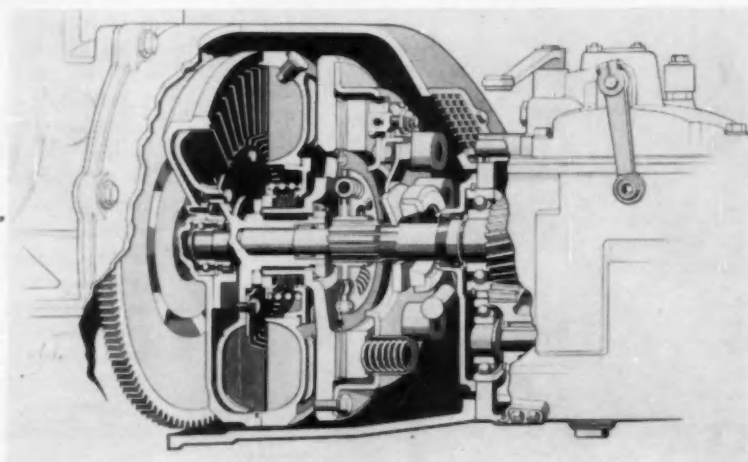
tion equivalent to investing a much larger sum in mills and furnaces, and this is a compelling incentive in an industry where inflation operates with special force.

Mr. Hunter likened the launching of the first earth satellite by Russia to the detonation of the first atomic bomb—both events were sponsored by powerful Governments to achieve certain objectives, and one deals with the infinities of outer space while the other deals with the infinitely small. "We must have a police force," he continued. "Yet \$36 billion is taken of our substance in one year, to return no income, to produce nothing, essentially to keep the peace by threatening the aggressor with annihilation. In contrast, in this country in 1956 we spent \$7 billion for research. . . . A telling comment when the greatest peace-loving nation must put forth five times the effort to annihilate as it does to create."

New Automatic Transmissions and

By
Robert
Braunschweig

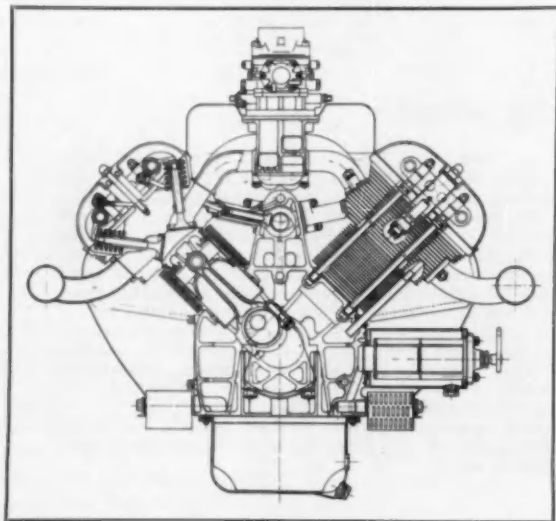
Mercedes-Benz Hydrak automatic drive has hydraulic coupling plus automatic single plate clutch.



NEW miniature cars, air sprung commercial vehicles, and automatic clutches were features of the 38th Biennial German automobile show held at the 650,000 sq ft Frankfurt fair grounds.

An exhibit by DKW included a prototype of a new small five-passenger sedan equipped with a two-stroke, two-cylinder, 40 cu in. engine. This front wheel drive model is rated at 30 hp. The three-cylinder, two-

Tatra V-8 engine has inclined overhead valves in hemispherical combustion chambers. Piston displacement is 155 cu in. and output is 100 bhp.



stroke DKW was shown in an improved version.

The small DKW 600 was displayed for the first time by Auto Union. This is a four-five passenger, two-door sedan of modern design. It is powered by two-stroke, two-cylinder engine and has a fully synchronized, four-speed transmission. Drive is through the front wheels. Torsion bar springs is used both front and rear.

Other new DKW cars are a two-passenger sports coupe and a convertible. A 60 cu in. three-cylinder, two-stroke engine developing 55 bhp is used in these cars. This same engine can be supplied in the standard DKW 3-6 with a slightly lower power output (50 bhp).

Among the automatic clutch designs were the Saxomat by Fichtel & Sachs, the Mercedes-Benz designed Hydrak, and the Synchronomatic transmission produced by Zahnradfabrik Friedrichshafen, incorporating a hydraulic coupling, an automatic clutch and a push-button shifting. The latter is a fully synchronized, four-speed unit.

The new Goggomobil T-600 was one of the new vehicles displayed at the show. It is powered by a front-mounted flat twin 36 cu in., four-stroke engine. Drive is through the front wheels. Coolant air is used for heating the interior of the car. Coil springs are used at all four wheels with a single joint swing axle at the rear. A two-passenger convertible also has been added to the Goggomobile line.

Zundapp Janus showed a model with back-to-back seating and a centrally located engine of 15 cu in. piston displacement.

Porsche introduced a new detachable hardtop for the convertible coupe. A one-piece crankshaft is now



Swiss plastic body on VW chassis has no doors.
Complete car weighs only 1100 lbs.

Miniature Cars Shown at German Show



New Goggomobile T 600 has wraparound windshield. Drive is through the front wheels.

used on Porsche's 1600 models, together with plain connecting rod and crankshaft bearings. Previously, a built-up crankshaft was employed, together with roller bearings. The change to plain bearings is expected to result in a quieter-running engine. Roller



Auto Union 1000 with 50-hp, two-stroke engine



New Tatra 603 with V-8 engine located at rear.

bearings and a built-up crankshaft are retained on the four OHC engine.

A more powerful version of the Goliath was displayed at the show. Its 55-hp engine is equipped with two carburetors. A new coupe body for this model was shown.

The "Tiger," a four-wheel version of the Messerschmitt Kabinenroller, weighs only 660 lb and is available with either a 20 or 25 bhp engine. Seating arrangements with the passenger behind the driver are continued in this late model.

Numerous detail improvements and a new convertible with two-passenger body were introduced in the Maico 500.

The new large BMW models, consisting of four-door sedans, are offered with a 75 hp six or a choice of three V-8 engines between 100 and 140 hp. The 507 tourer is offered with a 195 cu in., 150 hp V-8 engine.

Among the other vehicles there is increasing use of the Mercedes-Benz single pivot, low-roll center, rear-swing axle. This is now fitted to the entire Daimler range from the 180 sedan to the injection powered 300 SL convertible.

The new Tatra 603 V-8 model from Czechoslovakia was displayed for the first time at a western show.

Safety features such as dished steering wheels, rubber covered sun visors and padded instrument panels, were shown by a few of the exhibitors.

Plastic bodies were shown by independent body makers for a DKW sports coupe, a Volkswagen roadster and Mopetta minicar.



The smaller Goggomobile is now available with a deluxe convertible body

SAE

National Aeronautic Meeting

New High-Strength, Heat Resisting
Materials and Advanced Produc-
tion Processes Are Among Subjects
at Meeting in Los Angeles

By R. Raymond Kay

TECHNOLOGICAL ferment . . . that's the state the aircraft industry now lives in. Its problems are many, because goals keep going up and up. Research and development have to hustle so they won't be run over by the future.

Cost of tools and equipment to build tomorrow's planes will keep going higher.

Equipment makers will have a new market as the aircraft industry converts to high tensile materials. There will be a real need for low speed, more powerful machines. Many high speed machines now used on aluminum won't convert for steel.

The future will be busy for equipment makers. Changes in materials will call for new furnaces and heat treating facilities. And the abundance of automatic devices will make for lots of new functional test equipment.

It looks as if steel and titanium will very soon take the lead as airframe-structure materials. Cobalt- or nickel-base "super alloys" are the big hope in the 1200-1700 F range; above that, molybdenum appears to be practical.

Lithium is the key to a new aluminum alloy; it will maintain high strength up to 400 F. Thus the thermal barrier which threatened the use of aluminum in supersonic aircraft is pushed ahead more than 100 F.

Cadmium gives a longer life to low-alloy steels used in airframes. Electrolytic coatings of the metal applied during the vacuum phase don't cause hydrogen embrittlement.

Use of high-strength weldments in fabricating aircraft structures improves quality and performance at low cost. It permits design flexibility and cuts machine shop tie-up. It produces structures comparable in strength and weight to machined forgings. And they're often less expensive.

Around the world in one day. We'll be doing this within 20 years—some say within 10. Another prediction cuts the travel time to three hours.

You'll see atomic-powered planes capable of unlimited range, high altitude, and supersonic speed. But chemical-type fuels will dominate the field for another 25 years.

New chemical etchants are needed for cleaning metals. Clean metals are a must for plating, ceramics, and adhesive bonding.

This was some of the talk in Los Angeles at the Society of Automotive Engineers National Aeronautic Meeting. The ever popular Aircraft Production Forum ran for three days instead of two.

Cutbacks, stretchouts, and cancellations in the aircraft industry affected the turnout this year. The spirit was there, but not the big attendance of recent years.

Experts at the Aircraft Production Forum panels presented the latest ideas on: procurement; program scheduling and control of changes; large structural components; manufacturing techniques—high temperature sheet materials; quality control as related to manufacturing; test equipment; control of manufacturing costs; metal-removal—high temperature material; electronic data processes, production control as used by manufacturing; plant engineering; management training; ground support equipment; aerodynamic smoothness and its impact on production; numerical machines, operation and maintenance; introducing new manufacturing techniques and processes into production; metal bonding.

Here's the trend of thinking from some of the more stimulating panels:

Introducing New Manufacturing Techniques and Processes into Production

Most significant fact: (a) The technical solution is the easiest part of the problem. Communications and "selling" the solution is the most difficult.

(b) There are no cut and dried ways or rules for introducing new manufacturing techniques into production.

General trend in the field: Manufacturing research is still a growing field in the aircraft industry. There will be further refinement and development of the methods of introducing new techniques into production.

Most interesting problem—how solved: When do the process developing personnel and organizations stop and the factory personnel and organizations take over? There's no pat answer. Each company must evaluate each problem on its own merits.

New developments: There's emphasis on the need of standard manufacturing process specifications for the aircraft industry and its subcontractors. Such standards would be of great benefit to subcontractors working for several primes.

Primary interest at panel: (1) Costs as related to profits. (2) Personnel: selection; training and coordination; communication among them.

Metal Removal

Most significant fact: (1) Procurement emphasis is on missiles rather than on manned aircraft.

(2) Ceramic cutting tools perform better using coolants. But they're not up to the performance of carbides.

(3) Chem-milling saves over machine milling in operator skill, time, tool cost. It can be done after forming.

Most interesting problem: (1) Lack of knowledge about CO₂ as a refrigerant coolant.

(2) Steel mills do not produce sheet stocks near minimum thickness tolerance; hence, advantage of belt slab grinding to give this requirement for weight vs horsepower ratio.

New developments: (1) Use of Chem-milling: (a) Permits milling after forming. (b) Works entire part. (c) Mills multiple parts, depending on the size of the tank.

(2) Belt grinding as a means of metal removal for slab (sheet) stock in one pass: (a) Rapid exchange of belts. (b) Accuracy to maximum of 0.004 in.

(3) Principle of Anocut operation to be used with other cutting operations.

Primary interest at panel: Materials, processing, and lower cost methods.

Numerical Machines: Operation and Maintenance

Most significant fact: Today about 350 companies are doing development work with numerical control or data processing. Every major aircraft company and a number of large subcontractors are now installing numerically controlled machine tools. The machines work fine—the problem is people.

General trend in the field: Automatic programmed tools, using automatic computer routines.

APT I: Development of routines.

APT II: Second order curves (two dimensions).

APT III: Entire surfaces (three dimensions).

This is a program headed by Massachusetts Institute of Technology, sponsored by U. S. Air Force and supported by Aircraft Industries Association. Fifty computer programmers are now working on this project.

Most interesting problem—how solved: How automatic programming of machine tools will affect existing engineering drafting practices. Douglas T. Ross, Massachusetts Institute of Technology, suggested: "Get the man and the machine (computer) together to make design decisions. The designer will have more freedom for creative work while the computer does the detail work—the drudgery."

New developments: Retrofitting and replacement of tracer controlled profilers by numerical control will result in large scale replacement of tracer controlled machine tools by 1959. Numerical control will help achieve tolerances that are impossible to get by any other method.

Primary interest at panel: How does numerical control of machine tools fit into existing design practices? What will this do to the required design tolerances? Will automatic computer programming replace design detail? How much savings? Will they be as much as predicted?

This panel also considered the economics of numerical machines and came up with these advantages:

- (1) Less scrap.
- (2) High quality, consistent parts.
- (3) Greater freedom in product concept.
- (4) Lower time span.
- (5) Reduced tooling; less tool storage space.
- (6) Smaller tooling budget.
- (7) Reduced tooling maintenance costs.

Aerodynamic Smoothness and its Impact on Production

Most significant fact: The requirements for aerodynamic smoothness are increasing more rapidly than are the techniques, skills, and abilities needed to achieve an aerodynamically clean airplane. As a result we must compromise on less than the ultimate at present in order to have production rates at acceptable cost.

General trend in the field: We must make bigger outlays for capital equipment to handle larger skins, machined ribs, forged bulkheads, etc. These are essential to the design for an airplane that will hold closer aerodynamically smooth surfaces under higher speeds and greater air loads. These pieces of equipment would include special-purpose machine tools and larger stretch presses.

Most interesting problem: Here's the industry's
(Turn to page 86, please)

Simmonds Fuel Injection System

features

Simplified Design

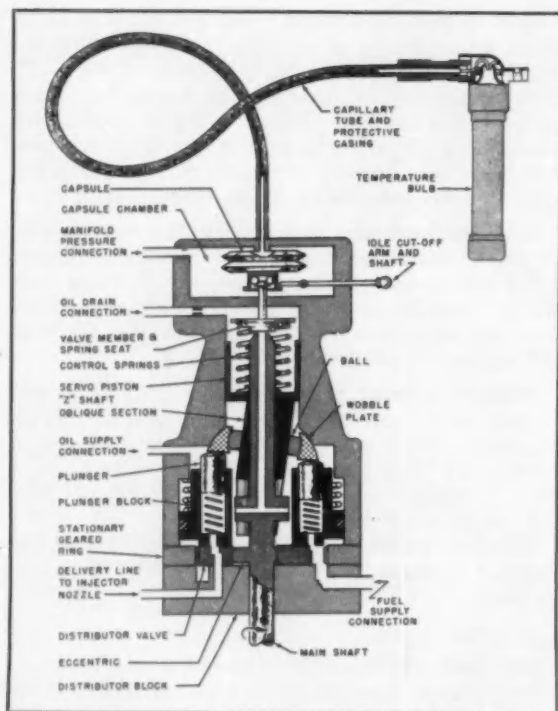


FIG. 1

▲
Schematic illustration of the 570 fuel injection pump

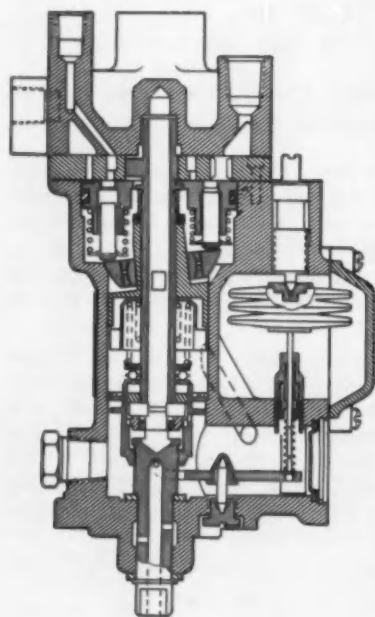
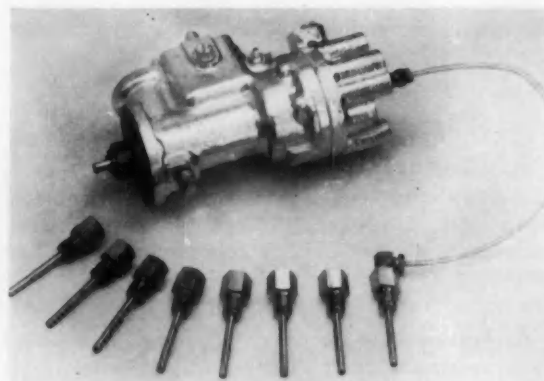


FIG. 2

▲
Fuel injection pump of the 580 series system

FIG. 3
Exterior view of the 580 series pump and nozzles



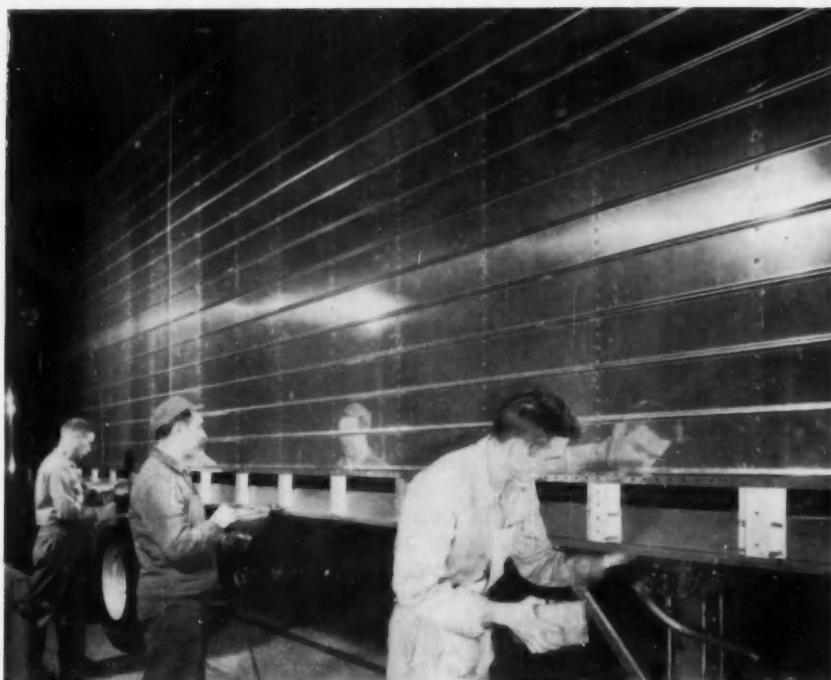
THE Simmonds fuel injection system is currently being manufactured in two basic configurations. One system, the 570 series (See Fig. 1) is now being produced for the Ordnance market.

This system utilizes a simplified speed-density metering system similar to that which is used on all British aircraft engines and which was used by the German Air Force on all aircraft engines during the recent war. The speed-density metering has been used on in-line engines of both liquid and air-cooled types. It has also been successfully applied to radial air-cooled engines.

In the Simmonds SU fuel injection system a multi-plunger, axial type pump (Fig. 1) is operated by a wobble plate, the stroke of which is varied by an oil operated servo system controlled by a capsule responding to manifold pressure and temperature. A valving system is incorporated to permit the individual plunger output to be delivered to the designated injection nozzle. The injection nozzles are located in the engine intake valve ports and aligned so that the fuel will be conveyed through the open intake valve and into the cylinder as the air charge is drawn in. Since both the air flow and fuel flow through the intake valve opening are substantially harmonic in character, a homogeneous fuel-air mixture will result. As mentioned above, an axial type multi-plunger pump with variable stroke is used to supply fuel under pressure

(Turn to page 118, please)

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Cross members on Fruehauf's smooth panel Aluminum Volume Vans are secured to bottom rails by Lockbolts

Assembly Methods at Fruehauf Trailer Co.

FRUEHAUF TRAILER CO. is using fasteners—called Lockbolts—in its Aluminum Volume Van trailers with maintenance-free results. Lockbolts secure cross members and sheets to bottom rails of Fruehauf's exposed post Aluminum Volume Van. On the smooth panel Aluminum Volume Van, they are used to fasten the trailer shell through posts to bottom rails.

Lockbolts, which are produced by Townsend Co. of New Brighton, Pa., are designed so that a minimum of skill is required to apply them. Standard Lockbolts are available in mild steel and two aluminum alloys, but they can be produced from other materials.

Lockbolts consist of two parts—a ground pin and a locking collar. The pin is inserted through the hole in the material being fastened and the collar is placed over the projecting pin tail. A special pneumatic or hydraulic gun swages the collar into annular locking grooves of the pin to form a rigid, permanent lock and automatically breaks the pin, ejecting the pin tail. The entire operation takes seconds.

The fasteners have an ultimate shear as high as 12,000 lb and an ultimate tension up to 12,500 lb,



A special pneumatic gun swages the collar into annular locking grooves of the pin of the Lockbolt

depending on the diameter of the pin and material. Standard Lockbolts range from 3/16-in. to 1/2-in. in diameter.

Fruehauf uses about 450 Lockbolts in each exposed post Aluminum Volume Van and 180 in each smooth panel trailer. When field repairs necessitate removal of the fasteners, they are always replaced with comparable Lockbolts.

In replacement, another Lockbolt of the same diameter can be used because the hole is only slightly enlarged. Experience has shown that it is possible to make several replacements in the same hole and still maintain an interference fit.

Multiplying Markets Seen for Magnesium

By Andrew W. Shearer

SHIFTS in the defense program have had some unsettling effects in the demand for magnesium in recent months. This major market for the light structural metal is, however, expected to pick up again as the expanded missile program gathers steam.

In spite of cutbacks and stretchouts in military orders, production of primary magnesium has been running at a high level and is expected to set a new level next year; estimated 1957 output is 80,000 tons. Shipments of mill products and castings are holding their own at the 53,000-ton rate of 1956.

Development of new uses and expansion of existing markets for magnesium are expected to take up any slack between supply and demand. Magnesium producers and fabricators see the automotive field as their biggest single potential market because new die casting methods are expected to make magnesium more competitive pricewise.

Such was the consensus of approximately 500 industry representatives and guests gathered in New York City last month for the 13th Annual Convention of the Magnesium Association. The formal two-day program, complemented by an exhibit of typical magnesium products, included some 20 technical papers. Extracts of selected examples follow.

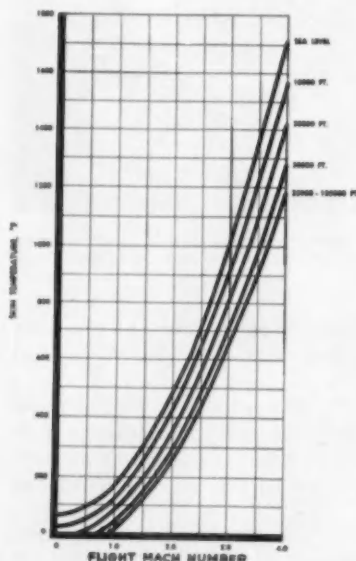


Fig. 1 — Estimated steady-state skin temperatures due to aerodynamic heating

The Use of Magnesium in Future Aircraft and Missile Structures

By JOHN H. RIZLEY
Chief Mat'l's and Process Engr. and
ROBERT E. MILHACO
Metallurgist

Convair Division, General Dynamics Corp.

SINCE World War II, the development of new aircraft and missiles has been very rapid and continuous. It is the intent of this paper to present some information on present-day applications and properties of magnesium alloys used in the aircraft and missiles industry. Stress will be laid on the need for continued development to assure alloy improvements necessary to realize the full potential of magnesium as a material for future designs.

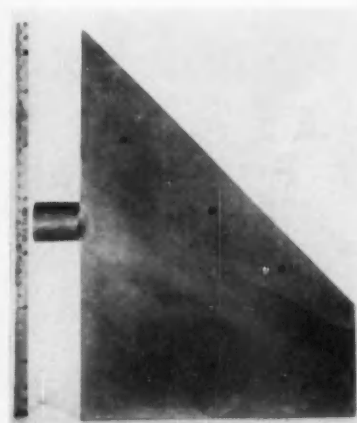


Fig. 2 — Cored booster fin, cast in AZ-91C

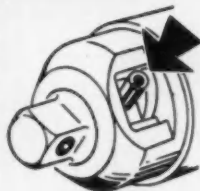
At supersonic speeds certain areas of an airframe attain temperatures which would preclude the use of magnesium alloys. For example, Fig. 1 shows the estimated skin temperature plotted against Mach Number. However, the relatively better heat conductivity of magnesium alloys has made possible its use in areas of heat sources such as electronic equipment. The increased conductivity has been used advantageously to dissipate heat in local areas.

Due to its lightness, magnesium will be in demand for future aircraft and missile structural design, so long as the development of new magnesium alloys keeps pace with competitive metals. These new alloys must maintain more attractive strength/weight and stiffness/weight ratios, both at room temperature and preferably at moderate temperatures.

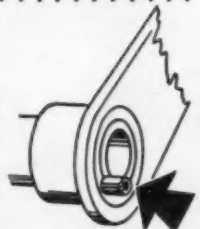
Most magnesium alloys have excellent castability, and the dimensional tolerances can be held closer than most metals. At the present time, the largest percentage of airframe castings are produced in AZ91C and AZ92A. Typical missile components now being made from these alloys would include booster fins and electronic equipment mounting boards. Fig. 2 shows a cored booster fin, cast in AZ-91C.

In future designs, magnesium cast-
(Turn to page 120, please)

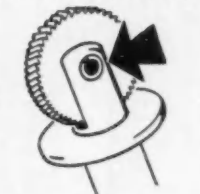
Rollpin[®] replaces 12 different fasteners



REPLACING A GROOVED PIN . . . in this application, Rollpin serves as a stop pin in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.



REPLACING A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than previous assemblies.



REPLACING A RIVET SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.



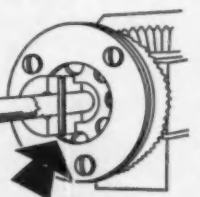
REPLACING A COTTER PIN . . . Rollpin assembly time is shorter, service life ten times longer. Vibration-proof flush fit. Easily removable.



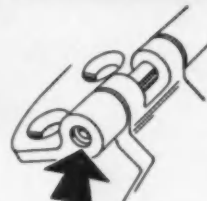
REPLACING A SET SCREW . . . to fasten automobile brake handle a short length Rollpin is self-retained in the hand grip but can easily be driven into over-drilled hole in shaft for simple handle removal.



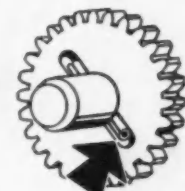
REPLACING A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application shown is the plate of a home workshop tool.



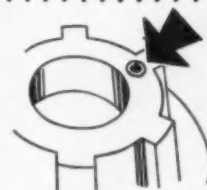
REPLACING TAPER PINS . . . in the assembly of precision differentials eliminated cost of taper pin reamers and the entire reaming operation. Rollpin costs less than a taper pin and installation is cheaper. They remove easily.



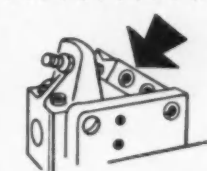
REPLACING A HEADED PIN . . . in this hinge pin application, Rollpin is simply and inexpensively driven in place, greatly reducing assembly costs. Constant spring tension holds Rollpin firmly in place . . . eliminates loosening of hinge due to wear.



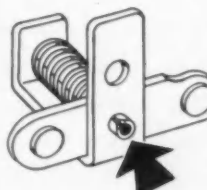
REPLACING A HUB ON A GEAR . . . Rollpin, self-retained in shaft, is simply snapped into mold-pressed slot to position sintered gear. This application, by an office equipment manufacturer, effects major savings in assembly. Rollpin's high shear strength is particularly valuable here.



REPLACING A DOWEL PIN . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.



REPLACING A BOLT AND NUT . . . Rollpins act as fasteners and pivots for the linkages in this electric welder. Rollpins may be used with a free fit in outer or inner members depending upon product design requirements.



REPLACING A RIVET . . . Rollpin serves as guide shaft for spring-loaded electrical interlock contacts. This electrical equipment manufacturer reports that rivet failure previously occurred at the clinched end under normal operating impact and vibration.

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AETNA BALL AND ROLLER BEARING COMPANY

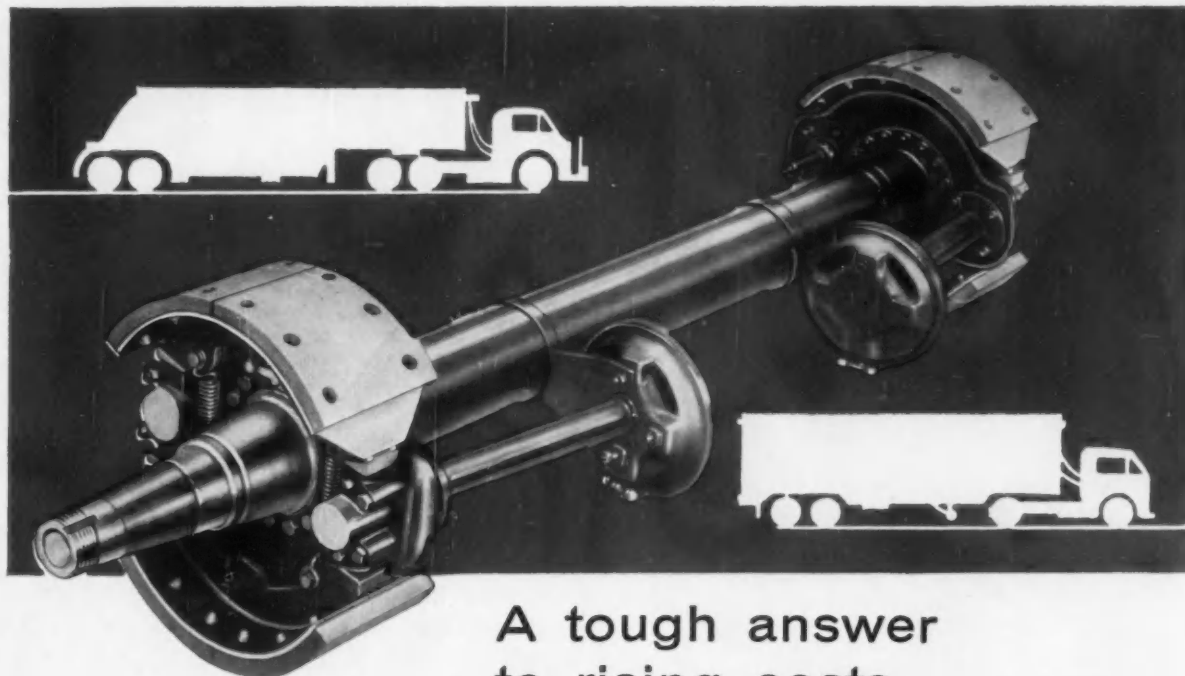
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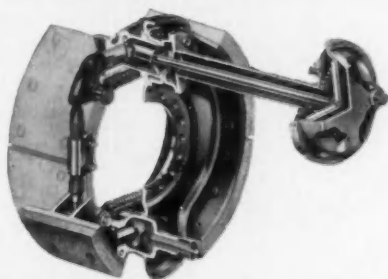
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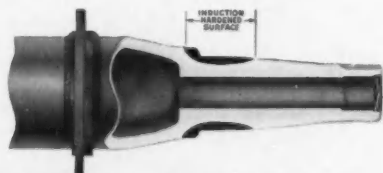


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Induction Hardening—For extra strength at a common area of failure, the inner wheel bearing surfaces are induction hardened, increasing the fatigue factor by 400 per cent.

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- induction hardened bearing seat for increased strength
- revolutionary brakes—more efficient, lighter, fewer parts

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- **Interchangeable parts cut inventory**—Two sizes of axle center use same wheel and brake parts—and these parts are also interchangeable with other makes of axle. Brake linings and shoes easy to remove—simplest possible design for low-cost maintenance.

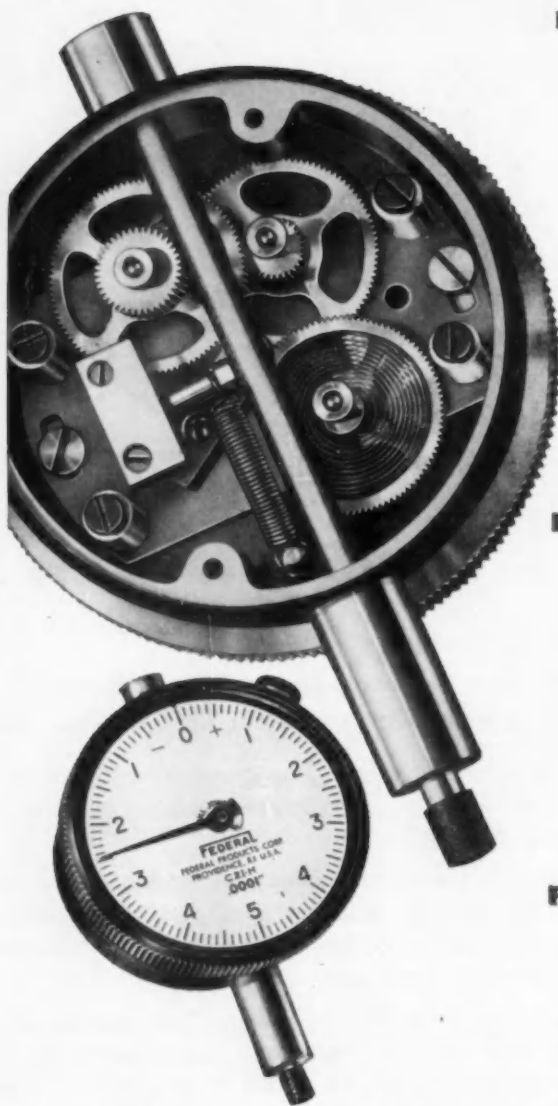
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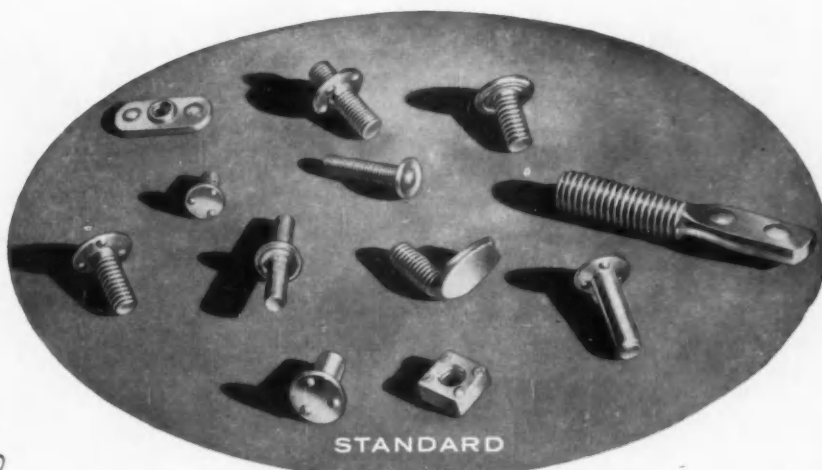
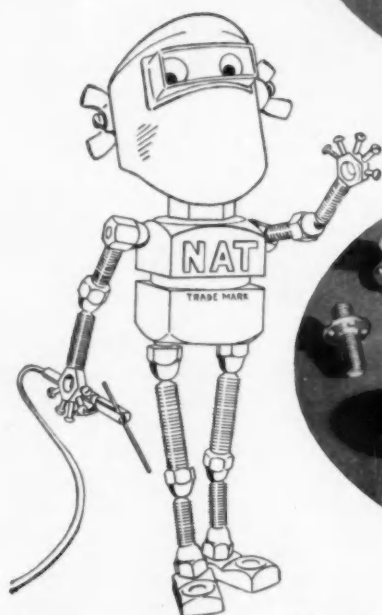
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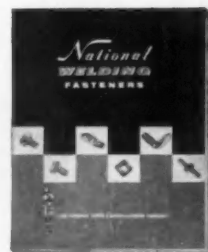
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News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Outlook for the Machine Tool Industry, Measurement of Cost Under Inflation Conditions, and Relative Merits of Sales Methods Discussed at NMTBA Meeting

Machine Tool Builders Hold Annual Meeting

Those attending the 56th Annual Meeting of the National Machine Tool Builders' Association were encouraged to look toward the future with confidence. This was the substance of the keynote speech presented by Jerome A. Raterman, 1957 president of the NMTBA and president of The Monarch Machine Tool Co.

The conclave, which attracted an attendance of more than 300 top executives from the machine tool industry, was held October 23-25 at French Lick, Ind. It convened in an air of gloom—reflected by September orders netting only some \$28 million total, the lowest monthly volume in recent years. At least some of this pessimism was dispelled before the meeting adjourned. Many left the gathering impressed with the fact that downswings in business, as well as upswings, are normal courses of events in the capital goods industries, and carried with them more optimistic hopes for an upward order trend in the not-too-distant future.

As Mr. Raterman pointed out, total machine tool shipments for the first three-quarters of 1957 totaled about \$675 million and it appears probable that total 1957 shipments will be "at least \$800 million." He commented, "I would call this a very substantial volume," adding, "this figure has been exceeded in only four of the last 13 years—and three of those four reflected National Defense demand due to the Korean crisis."



ALFRED V. BODINE
President-Elect of
NMTBA

With respect to new business, he admitted this presented an entirely different picture but went on to give comparisons with past results. Net new orders for the first nine months of this year totaled around \$445 million; with net new orders for the 3rd quarter averaging about \$43 million per month. "If this (3rd quarter) average should be maintained in the future," Mr. Raterman said, "it would indicate an annual volume of about \$516 million per year." "Before we start singing the blues at any such prospect," he stated, "let's go back and make a few comparisons." During the peacetime years of 1946 to 1950, and 1955 and 1956, "seven years during which the industry had practically no carry-over from defense emergencies," production averaged \$434 million a year—"an amount considerably below what we can expect today if new orders continue at the present rate." Mr. Raterman summarized this by saying, "That is one reason why I cannot get alarmed about the present situation. The other reason why I can't get alarmed is the

(Turn to page 168, please)



RALPH J. KRAUT
First Vice President



ALAN C. MATTISON
Second Vice President
and Director



GRAHAM E. MARX
Treasurer and
Director



WALTER K. BAILEY
Secretary



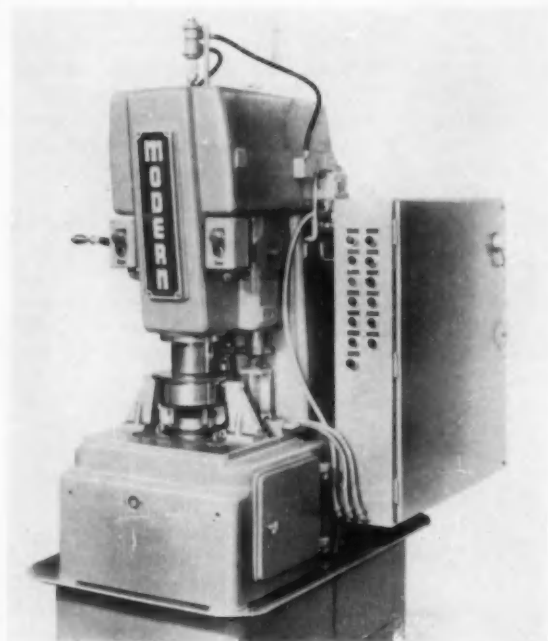
JULIAN C. PEASE
Director

NEW

PRODUCTION and PLANT

EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Model BMI-15M — Modern deburring and chamfering machine is equipped with a built-in chip disposal unit. Automatic indexing of the part from slot to slot takes place during the return stroke of the tools.

Modified Unit Deburs And Chamfers Slots

FUNCTIONAL chamfering of slots can be accomplished with a new machine, Model BMI-15M, recently announced. The single-station deburring and chamfering unit will deburr and chamfer slots at the rate of over 200 parts an hour.

Parts are manually loaded in the work station and a radial locator is actuated by the operator to assure positive part-positioning. The quill then comes down and the part is automatically air-chucked clamped.

The parts locator is then retracted and the cutting cycle is started by the operator pushing two pushbuttons mounted on opposite sides of the machine. An electric counter controls the slot chamfering. The counter stops the cutters in a retracted position. The parts locator re-enters the part; the part is unclamped and the quill is raised. The operator then unloads. Cutting is dry, coolant is unnecessary. *Modern Industrial Engineering Co.*

Circle 30 on postcard for more data

Proximity Switch

WITH the introduction of a new unit that can be mounted on a surface that extends only $3\frac{1}{4}$ in. from the material which operates it, Minneapolis-Honeywell has expanded its line of proximity switches. These units are precision static switches for use in detecting a ferro-magnetic object without coming into direct con-

tact with the object. Detection is accomplished by the object's passing through a magnetic field set up directly in front of the switch's sensing end. A signal flows through the switch's magnetic circuitry to operate a control relay. The relay may be operated up to 10 times per second.

The new switch, designated 2FA1, cannot be accidentally set in action by

ferrous chips. The entire switching element and sensing unit are potted and enclosed within a heavy steel casing to insure positive operation even in the presence of liquid coolants and in dusty locations. *Micro Switch Div., Minneapolis-Honeywell Regulator Co.*

Circle 31 on postcard for more data

Versatile Torque Wrench

HIGH torque application requirements can be met with a new multi-range, multi-purpose torque wrench now being offered along with a new series of adapters. A number of versatile arrangements are available as standard stock items. A normal 150 lb-ft torque wrench can be increased for applications as high as 300 lb-ft. A normal 300 lb-ft wrench can be increased to 600 or 900 lb-ft. The torque wrenches have pivoted heads.

The new tool adapter accessory is a heavy duty, light weight, conventional hand tool that enables using box end openings, ratchet end or a conventional drive square so that sockets can be used. Each of these



Sturtevant torque wrench adapters

adapter end accessories may be interchanged and yet maintain the proper lever length of the adapter. A wide range of box end openings are available from $\frac{3}{4}$ to $2\frac{1}{2}$ in. *P. A. Sturtevant Co.*

Circle 32 on postcard for more data

Steam-Jet Cleaner

REDESIGNED and now on the market, the new Speedyelectric standard steam-jet cleaner carries a maximum rating of 20 kw per hr and, under normal operating conditions, usually consumes 15 to 18 kw per hr. Units are available for 200 V, 440 V or dual voltage 220/440 V, three phase, 60 cycle. The machine operates on the electrode principle and has no tubes. It is free from fire and explosion hazards. Machine tools, presses, conveyors, intricate machinery, and other equipment may be steam-jet cleaned in place during regular working hours. Utilizing the blast of hot dry steam, alone, or mixed with concentrated detergents or solvents, the operator has fingertip control of the amount of liquid used in the cleaning operation. Flooding of the working area is eliminated or held to a minimum consistent with the type and amount of dirt accumulation to be removed. *Pantex Mfg. Corp.*

Circle 33 on postcard for more data

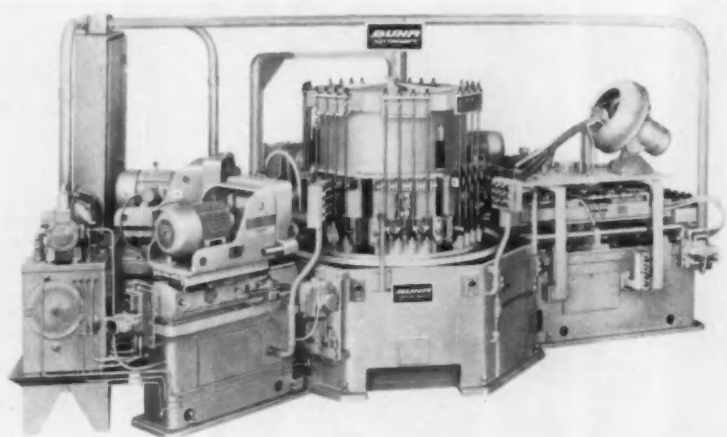
Blade Cuts and Chamfers

ANNOUNCEMENT of a new carbide cutting blade for automatic screw machines has been made. A chamfering edge incorporated on the blade is said to provide chamfering and cutting simultaneously. A portion of the blade is gashed to allow clearance so that work can be cut off in either direction of rotation. A brazed steel hub holds the blade in place. The new tools are available from stock with outside diameters from 1 3/4 to 3 in. and normal thicknesses. *Gay-Lee Co.*

Circle 34 on postcard for more data



Gay-Lee carbide cutting tool.



This automatic assembly unit incorporates assembly with various machining operations. Steering gear components are produced at a rate of 489 pieces per hour net.

Seven-station Machine for Steering Gear Parts

ONE of the latest Economatics is a seven-station automatic assembly unit that features an improved production method by incorporating assembly with various machining operations.

The unit contains a gripping device which unites the workholding fixture and assembly unit into an integral mechanism. This design is said to eliminate excessive loads on the index table that might be generated by the pressure of pressing the pins into the shafts. Individual hydraulic cylinders are used to press each pin and maintain a close positional tolerance required in the sub-assembly. A mounting pad is provided on the periphery of the machine base in an-

ticipation of automatic unloading of the parts. The operations performed by the machine are manually load four pieces and automatically power clamp, spotdrill for countersink, drill through for ream, end cut ream to straighten hole, size ream for close tolerance, press in pin and automatically unclamp and manually unload four pieces. Other features of the machine include precision machining of standard and special machine and fixture parts for interchangeability and ease of maintenance, automatic lubrication of all moving parts, hardened and ground detachable steel ways, and J.I.C. standards throughout. *Buhr Machine Tool Co.*

Circle 35 on postcard for more data

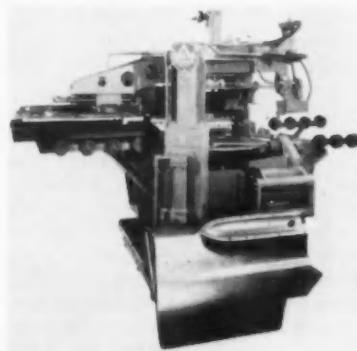
Hemming Machine

DEVELOPED by Delta Welder Corp., the Delta Hemmer is a new machine designed for the crimping of automobile doors, hoods, deck lids and related parts.

The door, outer and inner panels preassembled by a few spot welds, is automated into the machine on a non-marking, roller type outrigger. The door then moves onto a rubber roller lifter unit where it is positioned by an air actuated stop finger. A pressure pad descends simultaneously with the lifter unit positioning the door on the dies. Complete hemming is done in two operations. After the dies retract, the completed door ascends to the shuttle position where it is ejected by an air cylinder ejector onto a rub-

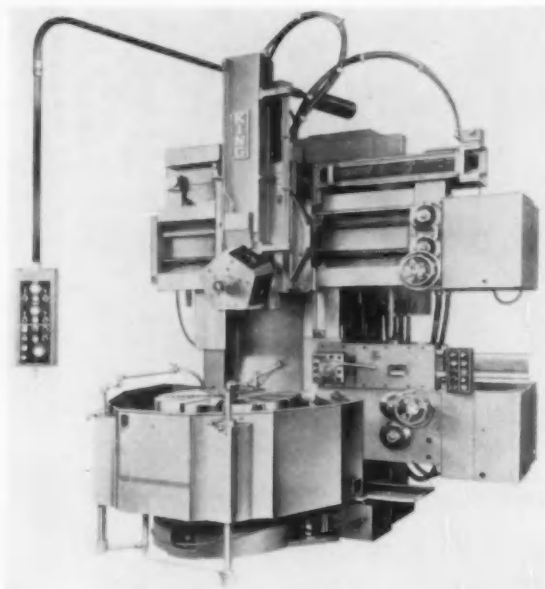
ber roller outrigger. Top capacity in excess of 700 per hour. *Delta Welder Corp.*

Circle 36 on postcard for more data



Delta Automatic Hemmer.

NEW PRODUCTION and PLANT EQUIPMENT



King boring mill with automatic feed stops offers optional equipment such as automatic tracing of heads, automatic cycling, power indexing of turrets and constant surface cutting.

Redesigned Electrically-Controlled Boring Mill

OPTIONAL features available on the new-design King vertical boring and turning machine include automatic stops, automatic tracing control of heads, automatic cycling, power indexing of turrets and constant surface cutting. One vertical and one horizontal adjustable stop is provided for each of the five turret faces for standard five-position turret heads. Two hp's are provided on each machine: 40 and 50 hp on 30, 36, and 46 in. sizes, 75 and 100 hp on sizes 56 in. and up. Expanded feed and speed

range provides 24 feeds from 0.0016 to 0.250 per table revolution, and 24 speeds in any one of three standard ranges: low, intermediate, or high. Both feed and speed selection are pre-selective from direct-reading dials. A newly designed spindle and spindle mounting provides table stability, and unit construction of spindle drive permits removal of the drive as a single unit for maintenance. *American Steel Foundries, King Machine Tool Div.*

Circle 37 on postcard for more data

Vapor Steam Cleaner

DEVELOPMENT of a new, heavy-duty steam cleaning machine has been announced. The new cleaner is fully automatic. Full operating pressure is generated within 90 seconds. A mechanical outside safety valve is provided as a check on the electrical limit switch and by-pass valve. Heating coils are protected by a control which stops the entire unit should the water supply fail. The entire electrical system is protected by an over-load switch.

After the required amount of hot water is fed into the compound tank to insure proper dissolving, the solution is then fed into the steam stream in the desired strength as selected by the metering valve. A metering valve measures water content of the steam,



Circo vapor steam cleaner.

enabling the operator to obtain dry steam at one extreme of the valve. A burner which will operate on kerosene No. 1, No. 2 fuel oil or light diesel oil

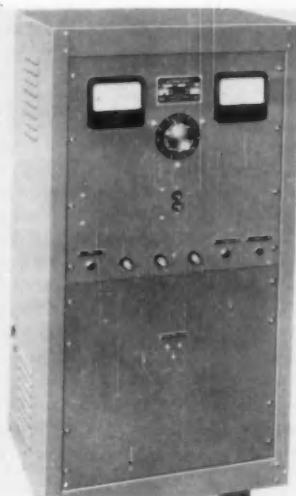
is another feature of the machine.

The machine is available in stationary or portable models of 120 gal capacity. It is provided with a multi-purpose balanced swivel type cleaning gun with control shut-off. Attachments include the Aqua-Jet gun for handling special compounds, such as paint strippers or special cleaners, when it is not desirable to change the compound in the tank; or for short runs. The Radi-Flush for cleaning and reverse flushing of clogged engine radiators is another attachment. Power for the unit is a continuous-duty, full bearing $\frac{1}{2}$ hp motor that requires no lubrication. *Circo Equipment Co.*

Circle 38 on postcard for more data

D-C Power Supply

MODEL FR100, an addition to a line of d-c power supplies operates on 208/220 V ac, 60 cycles, three

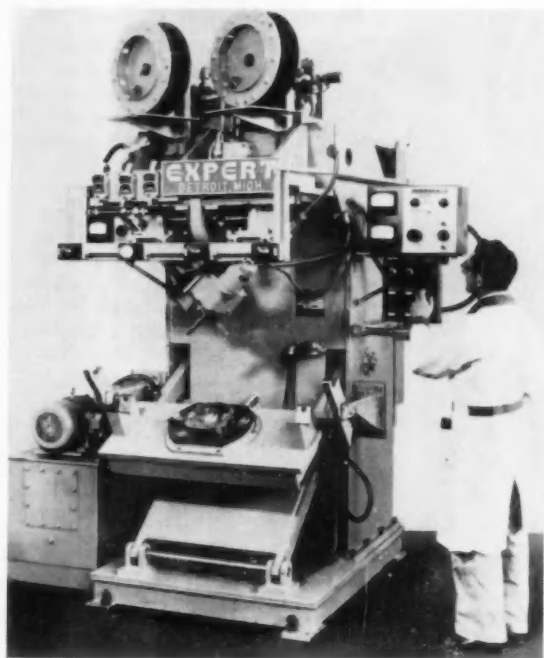


D-C power supply, FR100.

phase and is rated for continuous service at 0-30 V dc at 100 amps. Ripple does not exceed 4 per cent of the average dc output. Regulation is approximately 8 to 10 per cent at 30 V.

The heavy duty convection coiled unit features protection against internal failure, external short circuits or overloads and momentary power interruptions. Also low input voltage, rectifier thermal overload and phase failure. A panel mounted indicator light signals a fault condition. Circuit interlocks are arranged not to reset until the fault is corrected. Overall dimensions are 22 by 18 by 46 in. *Opad Electric Co.*

Circle 39 on postcard for more data



Expert single-station machine performs linear reinforcement welds on the inside seam of the banjo section of rear axle housings at a production rate of 250 pieces per hour.

Single-Station Automated Welding Machine

WELDING operations on the inside of tubular production parts can be accomplished by means of a new single station automated welding machine now on the market. The machine produces linear reinforcement welds on the inside seam of the banjo section of rear axle housings at a production rate of 250 pieces per hour.

Two welding heads are mounted at 45 deg angles on separate slides to permit entrance into the inside of the banjo section. Both slides are driven by a common lead screw which contains both a left and right-hand thread. The lead screw is operated by a vane-type hydraulic motor through a chain and sprocket drive.

The machine uses welding wire having a tubular cross-section. Flux needed for the welding operation is contained inside the wire permitting welding in small hard-to-get-at areas where flux depositing equipment would be difficult to use. The table, which is operated by an air-powered toggle type lifting mechanism, is automatically raised to the welding station with the axle housings clamped in position.

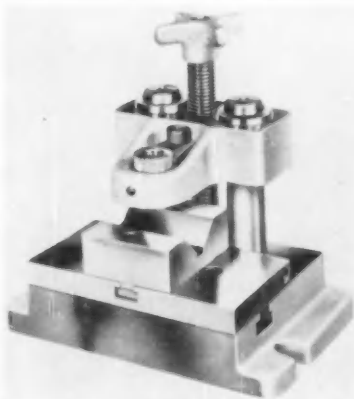
After the welding is completed the table moves downward and the part is removed from the fixture by two stripper fingers. The machine is nine ft high and occupies a floor space of about 5 by 6 ft. Welding current is supplied by two 600-amp generators.

The machine utilizes two air cylinders and one hydraulic and one electric motor. *Expert Welding Machine Co.*

Circle 40 on postcard for more data

V-Block Drill Jig

STANDARD equipment on a new drill jig includes two interchangeable v-blocks, three interchangeable adapter bushings and a centering locator plug. It handles workpieces up to 2 in. OD



Rockford v-blocks drill jig.

and the drill diam sizes are from 0.0135 to 0.5625 in. Steel surface plate, v-blocks, and all mounting surfaces are precision machined. Adapter bush-

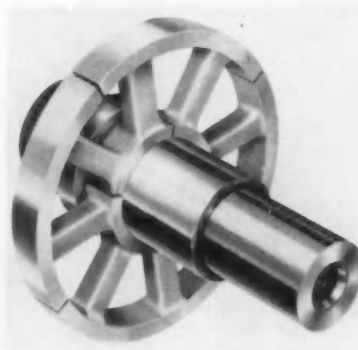
ings of 5/16, 1/2, and 3/4 in. OD size are provided as inserts for the clamp plate to accommodate ASA standard drill jig bushings of 0.0135 in. diam through .5625 in. diam. V-blocks, 9/16 and 1 1/2 in. in v-widths, handle stock sizes from 1/4 through 2 in. OD. Four-way adjustment of the v-blocks is controlled by machined t-slots and adjusting screws. Tapped holes are provided at both ends of the jig for attaching stock positioning rods. Slots in the base for bolting the jig to the machine table are 5/8 in. wide.

The v-blocks are secured by two socket-head cap screws, can be quickly changed, and can be adjusted on center with the locator plug provided as standard equipment. Adapter bushings are changed by loosening a single lock screw and inserting a new size. *Rockford Engineered Products, Inc.*

Circle 41 on postcard for more data

Expanding Arbor

ADDING to a line of expanding chucks, arbors and gages is a new arbor named the Arbor on Arbor. It has no external moving parts. It consists of a base expanding arbor on which sleeves or wheels of any size can be used. The same expansion is obtained on the OD of the wheel as on the base arbor. The built-in hydraulic pressure system is actuated by either air or hydraulic pressure for high speed operations. For low speed operations or high precision inspection the actuation is done manually. The hydraulic pressure builds up a force, up to 10,000 lb psi which stretches the steel sleeve

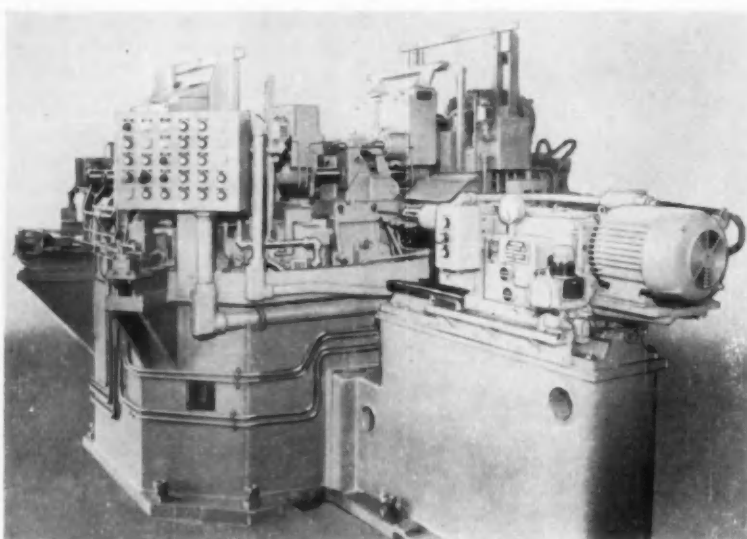


Hydra-Lock expanding arbor.

outward. Using a solid sleeve, the expansion is up to 0.003 in. per in. of arbor diam, while with a split type sleeve the expansion is 0.010 in. per in. of arbor. *A & C Engineering Co.*

Circle 42 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Natco automated machine features a horizontal unit with three drilling heads

Automated Machine with Three Drilling Heads

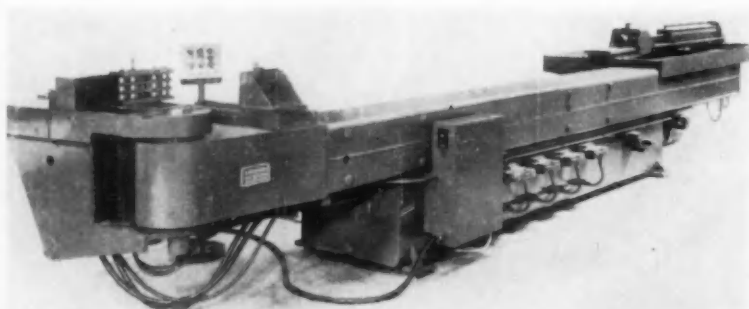
THE feature of a new machine developed by Natco is a special horizontal unit with three heads. The three-way unit was designed for accurately drilling the front section of automobile frame assemblies for cross members.

The outside heads have two-stub spindles each pointing toward the center and the center head has two-stub spindles on each side pointing toward the outside heads. All heads have a common mounting and move together; first in one direction to drill the cross members from one side, then in the opposite direction for the op-

posite holes in the cross members.

At the start of the drilling cycle, two 2-spindle drilling units come in from each side to combination-drill and ream two 9/16-in. diam holes in the sides of the frame. At the same time, the multi-head moves at right angles to drill, ream and chamfer four 3/8-in. holes in the cross members; then reverses its direction to perform identical operations on the opposite sides of the cross members. Machine cycle time is approximately 60 sec for all operations. *National Automatic Tool Co., Inc.*

Circle 43 on postcard for more data



Preset Bending Cycle Automatic on New Machine

Weighing 14,500 lb and measuring 23 ft, this new Leonard Bendmaster is now being offered. Annealed ferrous and non-ferrous tubing up to 6 in. OD and 20 ft in length can be handled on the machine. Maximum degree of bend is 180 deg. Maximum bend radius is 24 in. The machine is hydraulically operated. Designated Model 76, it performs the entire preset bending cycle automatically in one electrically-controlled operation. Controls are contained in a movable floor stand. (*Leonard Precision Products Co.*)

Circle 44 on postcard for more data

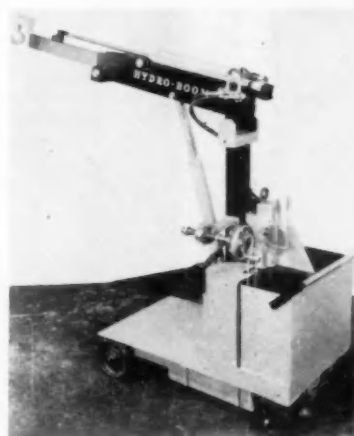
Furnace Impulse Monitor

PROVISION for shutting down an electric salt bath heat treating furnace is supplied by a new impulse monitor which acts in the event of control instrument or relay failure. The monitor is set manually. Timing devices offer two ranges: from 0 to 240 minutes or from 1/2 to 30 hours. Should the power input to the furnace continue longer than the time selected, the monitor signals an alarm. Separate contacts are provided for whatever alarm system is desired. *Ajax Electric Co.*

Circle 45 on postcard for more data

Hydraulic Boom Truck

NOW being manufactured for industry in general is a new type of boom truck designated the Hydro-Boom. With boom movement hydraulically controlled the operator can by telescopic action position work loads to within 0.01 of an in. in both vertical and longitudinal directions. Cross-wise movement is directed by a hand-operated screw in a close-fitting



Vanguard Hydro-Boom

swivel block. The boom features include no straddling of work loads, vertical, longitudinal and cross-wise movement of boom under full load and precision control of boom movement. The boom reaches up to 48 in. beyond the front end of the truck and capacity at maximum boom extension is 1500 lb, or 2500 lb with boom retracted. The Hydro-Boom is available in hand-operated or battery-powered models with or without power propulsion. *Vanguard Engineering Co.*

Circle 46 on postcard for more data

Automatic Feeder-Driver

STANDARD socket set screws are automatically fed and driven at rates up to 1800 per hr by a new feeder unit now in production. The machine will handle standard, unmodified socket set screws in either hex or multiple spline socket types, and with any of the standard points. Screws in diameters down to No. 2 wire size and up to $\frac{5}{16}$ in. diam can be driven, with lengths down to and shorter than the diam.

The feeder unit is adapted to a modified Detroit Power Screwdriver, and uses a mechanical rotating type hopper powered by a $\frac{1}{12}$ hp motor. This feeds screws at random into an escapement or tube which enters a selector unit. After the selector receives the screw, it indexes about 30 degrees, to a point directly above a feed tube which goes directly to the driver bit. A metal probe feels for the end of the screw, to determine which end is up. If the probe strikes solid metal, indicating the point end, the selector rotates 180 degrees, and the screw is dropped into the feed tube. If the probe detects the hollow socket, the screw is dropped directly. The selector then returns to its original position to receive the next screw. With typical screws in sizes such as

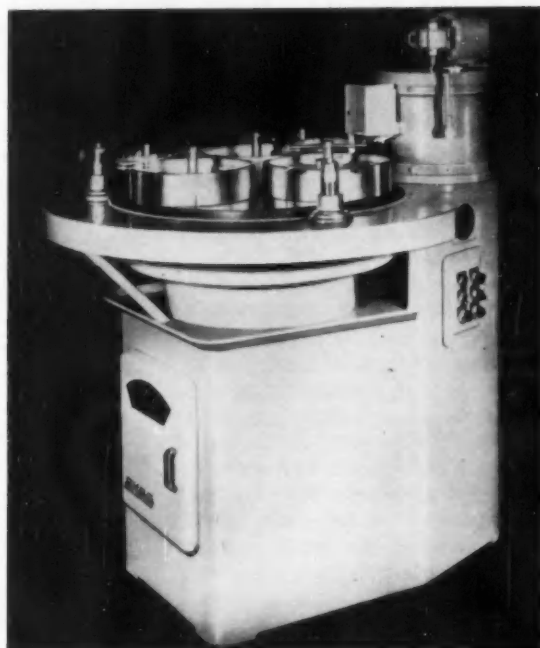


Bristol automatic feeder-driver for use with standard socket set screws will feed and drive up to 1800 screws per hr.

No. 10 by $\frac{1}{4}$ or $\frac{3}{4}$ by $\frac{5}{16}$ in., the average rate for feeding and inserting the screws flush in a tapped hole is 1800 per hr.

Typical applications for the ma-

Gyro-Matic 24, flat lapping machine couples push button operation with frictional drive.



Flat Lapping and Finishing Machine

Now available from the manufacturer, the Gyro-Matic 24 combines push button operation with frictional drive work retainer rings. Including a 24-in. diam anti-distortion lapping plate, the new unit is designed for production line lapping and finishing of all types of flat parts. It has double duty frictional drive parts retainer rings. These rings both retain and guide the work while conditioning the lapping plate during the cycle. An

aperture metering disc is provided to eliminate the possibility of grit build-up around the abrasive control outlet.

The Gyro-Matic is constructed with a circular work area. When the lapping operation is completed, piece parts are slid from the lapping surface directly to the circular work area. The complete abrasive tank is removable for cleaning and refilling. *Spitfire Tool and Machine Co.*

Circle 48 on postcard for more data

chine will lie in assembly and sub-assembly operations where a ring or knob is fastened to a shaft, such as in radio or automotive manufacture, or in pulleys, sheaves, gears and locking rings. *The Bristol Co.*

Circle 47 on postcard for more data

Thickness-Density Gage

ENGINEERED by the Budd Co. Nuclear Division, the new thickness or density measuring device named Gammascan is now available. To be used on continuously produced materials such as plate and sheet metal, glass and thick sections of plastic, the new machine utilizes a modified scintillation process. This process senses the radiation from a sealed self-contained gamma radiation source used

in the new detecting unit.

The Gammascan continuously analyzes the thickness of the materials under inspection. An output signal is provided which can be used for control of servo-mechanisms to compensate for indicated variations. It also provides a continuous written record of the thickness of the material as well as a meter indication.

A modified version can be used as a quality control tool for the detection of small flaws in thick sections of heavy materials. For example, a flaw $\frac{1}{4}$ in. in diam has been detected in a 5 in. thick section of lead.

The unit has a time response in the millisecond range and has been engineered to operate under typical industrial conditions. *The Budd Co.*

Circle 49 on postcard for more data

SAE National Aeronautic Meeting

(Continued from page 69)

dilemma. It will have to make increased capital outlay for this special purpose equipment. At the same time it's striving to make a profit with smaller contracts and lower production rates.

Primary interest at panel: Communication and education. Everyone agreed that aerodynamic tolerances have a definite impact on all phases of aircraft production from design to final inspection. Improvement will come only through the combined effort of all agencies involved. But the big urge is how to get each agency to understand the whole problem and the need for an acceptable solution to it.

Quality Control

Most significant fact: The trend toward quality control having a hand in original engineering design is becoming more widespread. Several companies are looking into this with the hope that it will improve produceability and reliability.

General trend in the field: Quality control is taking a greater part in the design and manufacturing problems inherent in the end product.

Most interesting problem—how solved: Auditing of quality control systems to determine compliance with specifications. This created a lot of floor discussion, but the problem remained unsolved.

Primary interest at panel: Costs and personnel.

Test Equipment

Most significant fact: Test equipment has become a problem of great importance in weapon system design. It can no longer be relegated to a minor roll. Management must recognize its importance and give it as much thought as it gives the primary product.

General trend in the field: Trend is to consider the test equipment at the inception of a weapon system concept.

Most interesting problem—how solved: How to coordinate test equipment requirements and where, within an organization, to place the responsibility for it. No one came up with specific solutions.

New developments: More automatic test and checkout equipment must come into use to replace the human operator in the short preparation time needed for takeoff or launching. This will relieve the manpower need at the final operational point.

Primary interest at panel: A department to decide on test equipment requirements. Methods and procedures for testing in the manufacturer's plant.

Metal Bonding

Most significant fact: Bonded sandwich and metal-to-metal structures have not been obsoleted by increases in operational temperature requirements. Metals are available to meet them. And inorganic and ceramic-type adhesives have the potential.

Whether or not they're developed in time to fill the need depends upon (1) the effort put into them and (2) the ingenuity of design; that is, toward their strength and away from their weaknesses.

General trend in the field: An effort to meet requirements for performance at higher temperatures and to assure reliability. The development of a non-destructive test method would be of great value in assuring reliability. It might cut costs by permitting reduced in-process control.

Most interesting problem—how solved: How to machine and bond complex contours. The core machining methods used at Northrop

and Convair seemed to answer most problems.

Use of polyglycol to chuck material, new valve-stem type cutters and special saw blades and sawing techniques seem to have the problem pretty well solved.

Autoclave bonding is apparently the best present answer for bonding severely contoured parts.

New developments: Current development work on ceramic adhesives should extend the applicability of bonded structure and perhaps make it competitive with brazed structure.

Primary interest at panel: Materials and manufacturing costs were the major interests.

Electronic Data Processes

Most significant fact: The subject is of intense interest throughout the aircraft industry for the shop loading, performance reporting, parts control, scheduling, and communication.

General trend in the field: Greater use of electronic data processing equipment in all of these functions.

Most interesting problem—how solved: Without destroying the value of the system, how can you handle engineering changes and other similar factors which affect schedules and shop-loading programs? Many solutions were suggested, most of them in actual use. For the most part they are variations of manual processes. A few were semi-automatic. But there are plans afoot at some plants for more automation.

New developments: Thirteen contractors and eight defense agencies now talk to each other in machine language. A joint program is underway to establish a common machine language, to standardize systems, to convert to magnetic-tape data processing, and to develop and use new methods for data transmission.

Collins Radio has under development a method of data transmission known as Kineplex. It is said that this system can transmit 3000 bits per second with an error rate of less than 1 to 10 billion. This system is said to be adaptable to wire or micro wave transmission and to be capable of converting automatically from one tape language to another. Cost is unknown.

Primary interest at panel: Tighter control of production ordering and release, shop loading, and hours control through extensive use of electronic processing machines. Strong stress on greater automation of all of these functions as the most desirable solution, although not necessarily the most economical.

Plant Engineering

Most significant fact: The vastly more complex nature of the plant engineer's job today, and his greater responsibilities because of: (1) Increase in complexity of modern aircraft. (2) Development of new materials. (3) More complicated machine tools.

General trend in the field: More specialized training in all levels of plant engineering from the engineer down through shop personnel.

Most interesting problem—how solved: How to provide the increased technical skills needed for maintenance of modern complex machines. Two effective answers:

(1) Specialized training of shop employees in their own fields. And basic training in the fields of those with whom they work closely.

(2) Use of engineers for preventive maintenance and for trouble shooting. This has proved out.

New developments: Integration of plant and industrial engineering. This makes for much improved coordination between these two often opposing functions.

Primary interest at panel: How to get more highly skilled help for plant engineering. How to improve organization of its functions.

Large Structural Components

This subject got a good going over. A. C. Carlson, Lockheed Aircraft Corp., talked about design considerations.

We will continue to design aircraft in the subsonic range. But we are already designing in ranges much over the speed of sound where aluminum alloys are no longer acceptable. Here we need steel and titanium.

Because of thin wing design, we will probably go to high modulus material using steel for wing bending material.

For maximum structural efficiency we will probably use thin skin panels, supported at close intervals—either close space skin and stiffener construction or sandwich construction.

We'll need strength levels of stainless steel from 230,000 to 250,000 psi. Tolerances on these sheets will be extremely critical as the weight penalty on a 4000 sq ft wing is 650 lb for a 0.001 in. increase in sheet thickness, using sandwich construction.

On an airplane the size of the B-52 a 1-lb increase calls for a 15-lb airplane weight increase to maintain the same performance. Welding and brazing will be primary joining means.

Titanium sheet construction will be needed for applications of stress levels lower than that required in wing bending material. Here we will use stiffener or honeycomb construction.

We are not in a position to use large steel or titanium forgings. Because the size will be limited by the available press capacity we are forced to join smaller pieces.

We'll need steel and titanium extrusions. Truss type construction is being seriously considered. Machining of the harder materials will cost from two to four times that of aluminum. Cutting is slower and cutting equipment four to six times as rigid.

Efficient design of future aircraft will need closer tolerance on the final components than we have today. That's because the

material weight is two to three times that of aluminum.

We have to get forgings, sheets, and extrusions that are larger and closer to final configuration. And we must develop economical methods of converting the material to the final close tolerance configuration.

C. C. Pope, Convair Div. General Dynamics Corp., offered a tooling philosophy to help solve manufacturing problems on large structural components.

He urged the industry to take an "intelligent stitch in time." This would, he feels, lead to mastery of a production program. How?

Use highly trained tool engineers, assigned as teams of specialists on a project basis. Have them operate as the spearhead of a strong tooling department in a closely coordinated line operation.

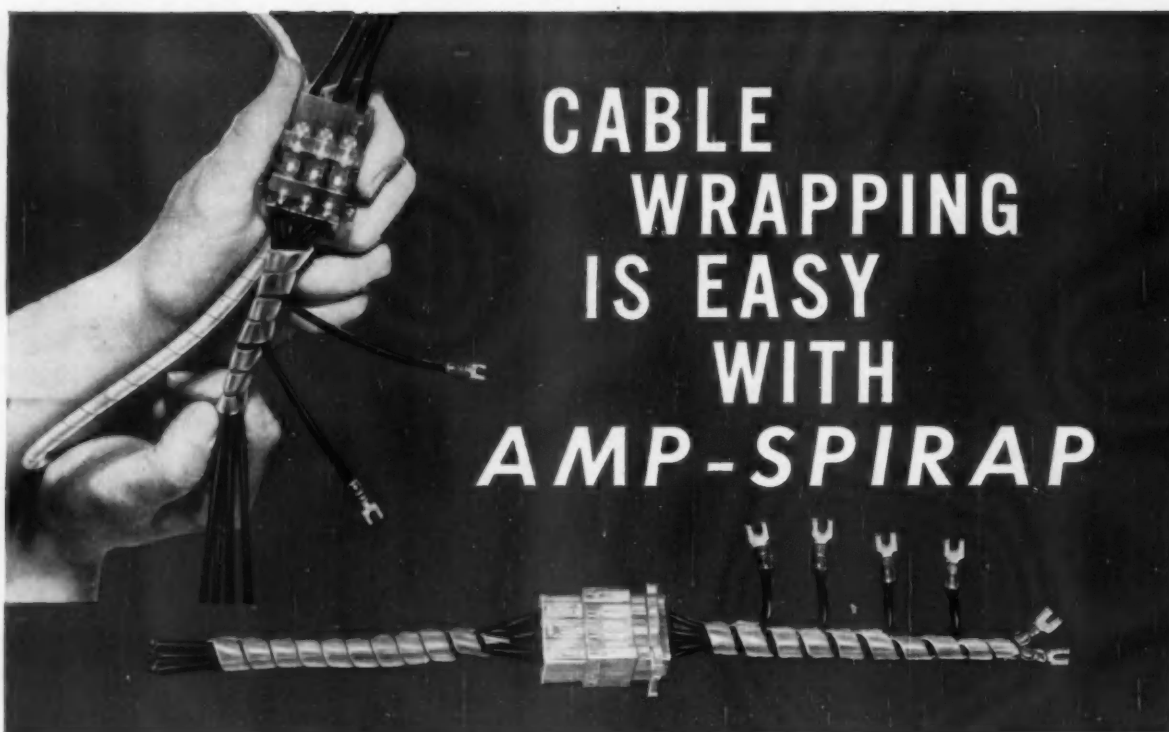
Much effort is going into the attempt to produce forgings as close as possible to exact dimensions, according to G. W. Motherwell, Wyman-Gordon Co. There is constant progress in certain controllable factors: automatic temperature control on die heating and stock heating, and better forging lubricants.

However, there are many factors still beyond control: difference in shrinkage; movement of the dies and press materials under constant high pressure; and distortion of the forging in subsequent heat treating operations. The straightening of a forging is sometimes a more difficult problem than its actual production.

These production problems make it necessary that we maintain very close cooperation and liaison between the designer of the structural components, the machiner, and the producer of the forged or pressed parts.

Manufacturing Techniques: High Temperature Sheet Materials

Current airframe design trends are directed towards new structural materials which show higher
(Turn to page 189, please)



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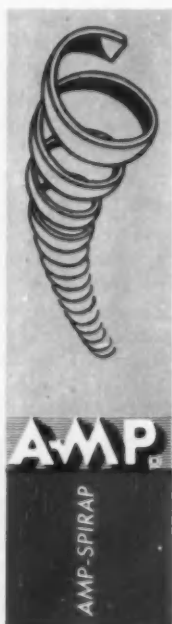
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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Close Center Drilling 1

Bulletin DH-957, contains a description of a close center drill head and automatic index table for producing any combination patterns of holes on a close center. A schematic drawing of both units is added. *The ConRay Corp.*

Geared Couplings 2

Described in 12-page book 2775, are four types of geared flexible couplings. Application and selection data for the couplings with maximum bores ranging up to seven in. and ratings from 2½ to 572 hp per 100 rpm are included. *Link-Belt Co.*

Teflon Parts 3

Facilities for custom machining Teflon parts are described in a folder prepared and published by *Raybestos-Manhattan, Inc.*

Adhesive-Bonding Units 4

A full line of new machines for assembling parts of various materials by adhesive bonding is described in six-page Bulletin CB-1 prepared by *Modern Industrial Engineering Co.*

Hardness Tester 5

Presented in a four page bulletin is a description of four combination hardness testers. A complete range of standard and accessory equipment is also described. *The Torsion Balance Co.*

Ball Bearings 6

Complete information about Hoover Micro-Velvet balls, including lapped high-carbon chrome balls, is contained in eight-page Bulletin 101. *Hoover Ball and Bearing Co.*

Chemical Processes 7

Covered in detail in a 16 page manual are 57 chemical processes. Cleaning, phosphating, conversion coating, descaling and electroplating are among those discussed. Reference charts are included. *Turco Products, Inc.*

Knuckle Joint Press 8

Knuckle joint embossing presses in capacities from 150 to 1000 tons for sizing, coining, embossing and similar applications are covered in an eight-page bulletin. *The Minster Machine Co.*

Blind Bolts 9

Blind bolts and blind nuts for structural and repair applications are described and pictured in a new bulletin, eight pages. *Hi-Shear Rivet Tool Co.*

Steel Collars 10

Applications, construction and specification details for steel shaft collars are given in a recently prepared bulletin, four pages. *Standard Pressed Steel Co.*

(Please turn page)

11/15/57

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Grinding Wheels 11

Enclosed in a four-page bulletin is a description of a complete line of cylindrical grinding wheels. Standard diameters range from 12 to 36 in. *Simonds Worden White Co.*

Precision Grinders 12

Designed to carry work pieces up to 6500 lb and supplied in center lengths from 48 to 168 in. is a line of cylindrical grinding machines that are described in a new 16 page catalog. *Landis Tool Co.*

Tumbling Abrasive 13

Form ESA-236, four pages, describes Berolon Tumbling Abrasive for barrel finishing. New sizing standards for chips are described. *Simonds Abrasive Co.*

Tool Room Grinding 14

Now available, a new 24 page brochure entitled "Tool Room Grinding of Alloy, High-Speed and Die Steels," covers 22 areas in the field. Subjects such as wheel shapes and markings, broachers, chasers, cutters, circular form tools and hobs, offhand grinding and cylindrical grinding are included. *The Carborundum Co.*

V-Belt Drives 15

Indexed for convenient reference, Bulletin A 661 contains information on the selection and operation of a line of V-Belt drives. The 108 page book includes a discussion on special drives and tables of pre-arranged drives. *Dodge Mfg. Corp.*

Machine Tool Catalog 16

Catalog 57 gives information about a complete line of machine tools including universal turret lathes, hydraulic tracing attachments, automatic opening threading dies and taps, automation, precision boring machines and automatic thread grinders. *Jones & Lamson Machine Co.*

Hydraulic Lubricator 17

Described in a two-page technical reference is the design and operating mechanism of a lubricator which is actuated by a machine's hydraulic cycle. Named the Bijur Cyclic Y Lubricator, the automatic pump will operate on any hydraulic line pressure from 500 to 3000 psi. *Bijur Lubricating Corp.*

Vacuum Furnace 18

Model 420 Brew high vacuum furnace, capable of operation at 2200 C, is described in six-page data sheets now available. *Vacuum Furnace Div., Richard D. Brew & Co., Inc.*

Connectors 19

Manual C 4 contains 44 pages describing AN, miniature AN, audio microphone, and RF connectors. Wire preparation and soldering techniques are also illustrated and discussed. *Amphenol Electronics Corp.*

Sponge Rubber 20

COHRLastic R-10470 silicone sponge rubber sheets for -100 to 480 F applications are detailed in a new two-page data sheet published by *The Connecticut Hard Rubber Co.*

Die Set Pins 21

Catalog 70-A, eight pages, describes a line of precision guide pins, shoulder guide pins and bushings and commercial guide pins and bushings, and includes specifications and prices for each. *E. W. Bliss Co.*

Metal Cutting Tools 22

Listed in Catalog 37C, is a new line of metal cutters and accessories. The 96-page issue covers an entire line of metal cutting tools, as well as arbors, adapters, collets, vises, index plates and various other items. *Brown & Sharpe Mfg. Co.*

Control Valves 23

Flo-Pilot valves, available in five basic models; ball cam, palm button, hand lever, locking hand lever and mechanical link clevis, used for remote control of master valves, directional control of small single acting cylinders and for shut-off are shown in Catalog 262, six pages. *Hanna Engineering Works.*

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The hydraulic power steering systems used on trucks like these have to be able to take it because the vehicles are required to take it. They are built for the rough, tough jobs . . . and the hydraulics must match. Heaviest axle loads . . . off road operation . . . the most difficult steering conditions possible are easily mastered by the power, inherent high quality, dependability and tough durability of Vickers Hydraulic Power Steering Systems.

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The Vickers Vane Type Pump has hydraulic balance that eliminates pressure-induced bearing loads and assures long life with minimum maintenance . . . the key to less downtime. Correct running clearances (both radial and axial) are automatically maintained, providing high efficiency throughout pump life.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

NEW

PRODUCTS

AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Trigger-Switch

Contained in a pistol-grip-handle is a new heavy-duty trigger-switch. The Esco type R design, installed at the end of a heavy duty cable facilitates control of electric circuits in mobile



equipment and where the operator requires freedom of movement for better visibility or safety.

The switch is waterproof and trigger travel is adjustable. Molded high impact phenolic is used in the grip. Electrical rating is 10 amp, 125 vac at 0.80 power factor. Action is momentary contact, double-pole single-throw, normally off. *Electro Switch Corp.*

Circle 60 on postcard for more data

Mold Parting Agent

Resin Release N, a new positive non-silicone parting agent for use in releasing plastic parts from compression, injection and casting molds or patterns is now being offered. It will not change viscosity or deteriorate up to 450 F. The non-melting product is water-repellent and non-toxic. Applicable to release problems involving such items as Polyester, Epoxy, Phenolic and Neoprene, it is unaffected by residual moisture or moisture released by resin reactions. It is soluble in toluene, xylene and related hydrocarbons. *Specialty Products Co.*

Circle 61 on postcard for more data

Finishing Formula

Depending on the temperature range of the bath, a new solution is reported to produce deep, lustrous black finishes on either plain zinc-die-cast or zinc-plated parts in about 10 to 20 seconds of immersion time. The finishes do not increase the dimensional tolerances of the treated parts. Applications include cameras or instrument components where non-reflecting surfaces are required.

The liquid, called Nero-Zinc, is applied to parts in the form of a bath. One part of the solution is added to three parts of water and then heated to a temperature of 110 to 150 F. A tank of stainless steel, ceramic or one of mild steel that is lined is suitable for the bath. *Wagner Brothers, Inc.*

Circle 62 on postcard for more data

Vibration Detector

Actuated by impacts, thrusts or excessive vibrations, a recently developed inertia-switch provides full-time protection for unattended industrial equipment. Once actuated, the switch cannot be jarred into an unactuated position.

Force-of-actuation settings are fac-



tory adjusted and may be supplied from 1.5 to 10 or more G's. The device will also resist normal vibration as tested under applicable parts of

MIL-5275-A. Contact arrangement is single pole, normally closed. Electrical rating is 1 amp, 6 vdc. *Micro Switch Div., Minneapolis-Honeywell Regulator Co.*

Circle 63 on postcard for more data

Dual Autopilot

Features of a new, all-transistorized, automatic flight control system, designed for dual feasibility, include a new altitude hold control, an automatic Mach number control and a heading select and hold control. An



automatic omnirange and approach system is incorporated on the new device.

Designated L-102, the new autopilot weighs the same and will fit into the same space as most single jet transport autopilots. Plug-in modules are used to attain maximum use of channel volume. The entire unit, weighing 83 lb, fits into a single rack: electronics in one half-rack and gyros in another. *Lear Inc.*

Circle 64 on postcard for more data

Compact Starter

Requiring only 270 sq in. of space, a compact vertical action starter is now on the market. The coil, contacts and overload relays can be changed without disturbing external connections. Up to four extra interlocks can be added in addition to the holding circuit interlock. Pushbutton and selector-switch-kits are available for addition to the new Size 5 starter in general purpose enclosure. *Square D Co.*

Circle 65 on postcard for more data

Sealed Gear Pump

Fluid flow is maintained in the same direction in a new sealed gear pump regardless of shaft rotation. The 2½ in. diam reversible pump can be mounted on any machine requiring circulation for lubrication or other purposes. Designed to be driven from a rotating machine shaft either directly or through a gear chain drive of suitable ratio, the pump is applicable to machine tools or any other machine requiring flood lubrication over gear trains, chains or cams. It is intended for recirculation pump systems.

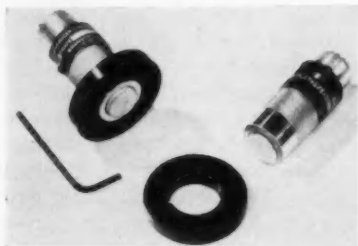
The discharge of the reversible pump is 50 cu cm per minute at 100 rpm and its recommended speed range is 20 to 500 rpm. Shaft seal is assembled 1/16 in. below the top surface of the pump. This pocket provides a pilot counterbore to center the drive shaft with the mating machine shaft if a tongue drive is preferred. The pump is capable of operating at discharge pressure of 150 psi with approximately 80 per cent efficiency. Overall dimensions are approximately 2½ in. diam and 1½ in. in height. It is constructed of close grained iron with steel pump gears. The drive shaft is provided with a flat for set screw.

Available modifications of the pump include bronze body and several drive shafts in addition to the one flattened for set screw. Among these are shafts for tongue drive, Woodruff key and other special requirements. *Bi-jur Lubricating Corp.*

Circle 66 on postcard for more data

Testing Transducer

Thickness gaging and flaw detection can be accomplished by use of a new ultrasonic testing transducer recently developed by Branson Instruments, Inc. The unit is adaptable to



testing such materials as lead, laminated plastics, castings, severely corroded sections and other poor transmitters of ultrasonic energy.

Immersion-mounted Type Z trans-

ducers are waterproof and operate at temperatures up to 250 F. Contact testing transducers will withstand temperatures up to 450 F. They have an overall OD of one inch, and a length of 1½ in. The active element is ½ in. in diam. They are available for frequencies of 0.5 through 10 mc. An impedance-matching adjustable adapter permits coupling to various kinds of test equipment.

Circle 67 on postcard for more data

Tube Coupling

Added to a list of products produced by a company for the aircraft and missile field, a flexible coupling recently developed allows a total of ¼-in. axial motion and ±30 flexure.



Identified as Part No. 6-6001, it is designed to meet Mil. Spec. C-25014.

Standard AND10058 and AND10060 beaded tube ends are used for fitting attachment. Standard O-rings are used for seals; standard gland dimensions are used to allow space for seal swell and to permit easier axial motion of the tubes.

Temperature limitations are established by the compound used for seals, and pressure limitations by the tubing wall thickness and bead stiffness. Fluids other than fuel can also be handled. *On Mark Couplings.*

Circle 68 on postcard for more data

Buffing Compound

PC-93, a new high-color buffing compound for finishing plastics, contains an ingredient that imparts anti-static properties to the part being finished. A built-in lubricant eliminates problems of roll-over or burning.

Formulated for high-color buffing of thermoplastic materials, the compound will, through its anti-static property, eliminate a processing step at many installations by doing away

with the need for immersing the part in a destaticizing solution. It is available in all standard bar sizes for both manual and automatic application. *Hanson-Van Winkle-Munning Co.*

Circle 69 on postcard for more data

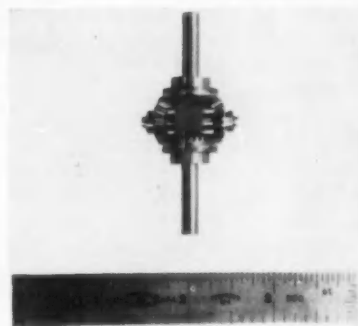
No-Shift Lift Truck

Manual shifting of gears can be eliminated in a line of lift-trucks by use of a new power shift torque converter drive offered as optional equipment. The new drive also facilitates controlled inching of the unit. Forward and reverse of the lift-truck is controlled by a direction selector mounted to the left of the steering wheel. This permits the operator to keep his hands on the wheel when shifting gears. The new drive also requires the engine to be in neutral before the engine can be started. The transmission automatically returns the drive to neutral when the driver leaves the seat. *Allis-Chalmers Mfg. Co.*

Circle 70 on postcard for more data

Differential

A bearingless differential having a backlash of approximately 30 minutes of arc is now available. Made of stainless steel spider and bronze bevel gears, both 48 and 72 diametrical pitch, the new bearingless variety tumbles within 1 plus 1/32 of an in. and any standard Dynaco stock precision hubless gear may be assembled to it. The 48 pitch version is available with a 0.1874 in. shaft and the 72 pitch model with a 0.1240 in. shaft.



A shaft up to four in. overall projection to user's specification is included, with longer shaft units being available on request. *Dynamic Gear Co., Inc.*

Circle 71 on postcard for more data

**AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED**

Design Details of Mack's New Intercity Bus

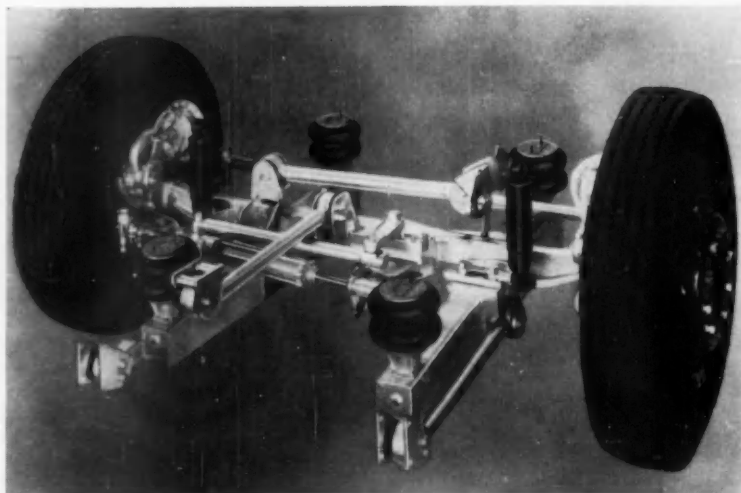
AIRGLIDE suspension, turbo-charged Diesel engine, built-in power steering, and welded tubular-frame body construction are among the features of Mack's new and initial offering to the intercity bus market. Introduced recently (see AI, October 1, page 39), the 41-passenger vehicle will be produced at the Sidney, Ohio plant of Mack Trucks, Inc. It is 35 ft long and 96 in. wide overall, and will be known as Model 9700.

Body Structure

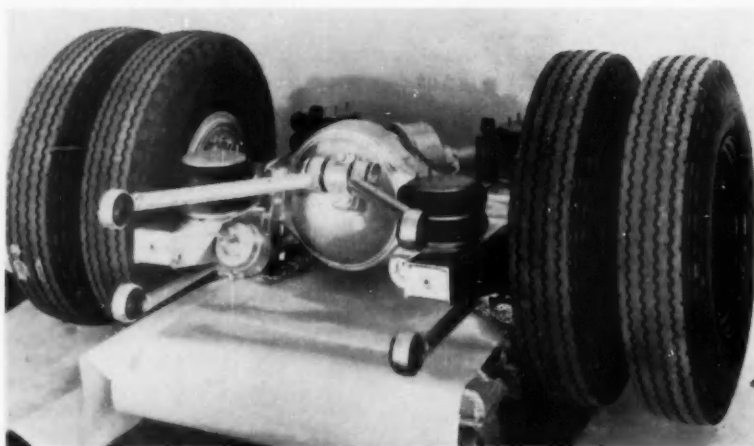
The structure of the integral-type body is made up of arc-welded, rectangular-section, high-tensile-steel tubular framing, with continuous posts and carlines from skirt rail to skirt rail, in combination with aluminum exterior paneling. Exterior panels are riveted to the 1¼-in. tubular steel posts and carlines with Southco blind type rivets, permitting ease of replacement. Side and front panels are of fluted anodized aluminum sheet. Roof panels are of smooth aluminum sheet. Contact areas between steel and aluminum pieces are separated by cloth-backed tape to inhibit squeaking and electrolytic action.

Powerplant and Drive

The engine, suspended transversely at rear of bus, is a Mack Thermodyne turbocharged Diesel, Model ENDLT-673, six-cylinder, four-stroke type. Bore and stroke are respectively 4⅞ and 6 in., for a total piston displacement of 672 cu in. Compression ratio is 16.59 to 1. Rated output of the engine



Mack front axle, viewed from front of bus. Note mounting of bellows and system of radius and torque rods used in the Airglide suspension. Also the overall steering layout and power steering hookup.



Mack rear axle viewed from front of bus, showing Airglide suspension bellows and radius rods. In background are shown the 52-deg angle drive to the axle and the pinion-shaft-mounted handbrake drum.

is 205 bhp at 2100 rpm; maximum torque is 560 lb-ft at 1500 rpm. Cylinder liners are of the dry type, made from centrifugally-cast close-grained iron. Supercharging is by means of an exhaust-driven centrifugal blower unit, bolted directly to the center of the exhaust manifold, that delivers air through ducting to the intake manifold. An exhaust muffler is dispensed with because of the expanding and cooling action of the turbocharger turbine.

The clutch, of Long manufac-

ture, is provided with a Mack Vibrasorb vibration-damping plate, and is manually controlled. The transmission is a Mack four-speed mechanical type, with constant-mesh helical gears and gear-type shifting clutches. All forward speeds are shifted manually, with a solenoid being used for reverse. Integral with the transmission is a bevel gear angle take-off from which the drive is transmitted through a propeller shaft (using two needle-bearing Spicer univer-
(Turn to page 166, please)



Handy "Vari-Speed" Governors, made by King-Seeley Corp., employ Torrington Needle Bearings with stainless steel rollers and brass shells for corrosion resistance and accurate, sensitive performance.

Twenty years later— still preferred!

Since the first installation before World War II, Torrington Needle Bearings have been used in Handy "Vari-Speed" Governors. These units govern engine speed for automobiles, trucks and buses by balancing air-flow pressure on the throttle plate against a calibrated cam-spring mechanism.

Torrington Needle Bearings were first used to insure sensitive response and regulation at low velocity and tension values—and are still preferred. They provide efficient anti-friction operation in the simplest and most compact design possible.

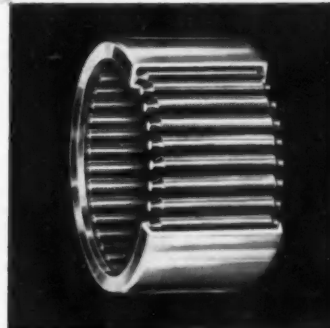
In every type of service, Torrington Needle Bearings have provided long, trouble-free and dependable service—as in so many other automotive applications. For engineering assistance on your requirements, see your Torrington representative. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

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AUTOMOTIVE INDUSTRIES, November 15, 1957





General view showing physical testing area of the new Product Metallurgical and Materials Testing Laboratory. The Physical Testing Laboratory inspects and determines the properties of all ferrous and nonferrous metals purchased by Caterpillar.

Caterpillar's New Testing Laboratory

CATERPILLAR Tractor Co. recently opened its new Production Metallurgical and Materials Testing Laboratory as a part of the company program of expansion. The new facility, occupying 22,000 sq ft at the Peoria, Ill., plant, employs more than 150 people, and is planned for expansion both in equipment and in personnel as necessary. It is intended to give the company closer control over materials and processes and to develop new practices in metallurgy and manufacturing.

One of the first of these new processes to be announced by Caterpillar was developed jointly by the company and by a supplier, Harrison Steel Castings Co., Attica, Ind. By this method, carbon steel castings containing a fractional percentage of boron have been produced by the acid open hearth process, thus provid-

ing the increased hardenability of boron-containing steel. Caterpillar is using cast steel sprockets on its largest size crawler tractors, and the trade designation Boralloy has been applied to these boron-containing steel castings. The use of boron to increase hardenability of steel is not new, it having been a part of wartime metallurgy to conserve scarce alloying elements. In addition to casting sprockets in the boron-bearing steel for use on all present production on its D8 and D9 tractors, replacement rims are being cast for the D8 tractor sprockets.

Other functions of the new laboratory are the evaluation of all new products submitted by suppliers, control of all materials during processing, development of procedures for standardizing operations, development of tooling and equipment for special require-

ments, and providing data to company officials concerned with improvement of product or manufacturing techniques. Laboratory personnel also assist in making purchasing decisions.

Materials tested in the laboratory include not only forgings, castings, bar stock, and tubing in ferrous metals and in bronze, brass, and aluminum, but a number of nonmetals also. Rubber, cork, plastics, paints, oils, solvents, and fibers are tested, along with structural steel and concrete used in the company construction program. A heat treat engineering staff studies both conventional heat treat operations in the plants, and new processes and equipment developed by the company's own personnel. To indicate the scope of heat treat processing of steel, the company pointed out that 34 per cent of the 30-ton D9 tractor is heat treated. Welding procedures of practically every known kind are used by the company, and welding engineering is an important division of the laboratory.



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more than 40 years of outstanding performance

In specifying components for the automobiles they build, car manufacturers will do well to examine the record of the Stromberg* Carburetor—more than 40 years of outstanding performance. Extreme RELIABILITY and outstanding GASOLINE ECONOMY are Stromberg's distinguishing characteristics. And the record proves it. Stromberg Carburetors are designed and built by Bendix-Elmira, pioneer in fuel system engineering and the *first manufacturer* to develop an electronic fuel injection system for automobiles. Owner loyalty is the auto maker's most priceless asset. Stromberg helps build owner loyalty.

*REG. U. S. PAT. OFF.

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- Fewer moving parts, fewer mechanical failures, reduced service cost
- Substantially reduced incidence of icing and percolation
- Thin aluminum throttle body and flange for quicker heat transfer

Bendix-Elmira, N. Y.
ECLIPSE MACHINE DIVISION



The BUSINESS PULSE

Decline in Key Indices of Economy, Reflected in Stock Market Uncertainty, Offset by Rise in Dollar Terms of Gross National Product. Relaxation of Credit Restrictions by Federal Reserve Board Seen as Genuine Possibility

The volatile nature of stock-market transactions in October reflected greater uncertainty in financial circles than has existed for some years. The principal reasons are fairly obvious. Events like the launching of Sputnik and the Middle Eastern crisis, coming on top of an apparently weakening business situation, proved too much for investor equanimity. Since they raised the basic and yet unanswered question of whether new direction will be given to U. S. military programs, they removed the basis for reasonable calculation. Thus, ripe conditions for unreasoning and exaggerated response to daily news items were created.

Very recently there have been some signs that sentiment is at least temporarily stabilizing, but it seems unlikely that the underlying uncertainty has really been dispelled. Business barometers are still very difficult to read. There can probably be no final resolution of questions pertaining to military programs until after Congress reconvenes.

Expected Adjustments Materialize

Incoming business reports have been predominantly unfavorable, producing widespread concern over the possibility of a substantial downturn. Virtually all major economic indicators were weaker in September on an adjusted basis, and data for October, though incomplete as yet, appear to be no more auspicious.

- Industrial production, as measured by the Federal Reserve Board's index, fell by

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

one point in September to 144 per cent of its 1947-49 average and failed to show any year-to-year gain. As in most earlier months of 1957, weakness in the durables sector more than offset stability in the non-durables area.

- Retail trade also lost ground in September on a seasonally adjusted basis, the decrease from August approximating two per cent in dollar terms. This experience was particularly disappointing, since retail trade had previously been the outstanding element of strength in the economy and the prime hope on which optimists rested arguments against the possibility of recession.

- Official estimates indicate that a smaller number of persons had jobs in September than a year earlier. The decline was most notable in the case of manufacturing production workers. Approximately 300,000 fewer production workers were on factory payrolls than in September, 1956, representing a decline for the year in excess of two per cent. The loss in man-hours worked was proportionately greater, since the average work week had been shortened in the interim.

- The index of business activity compiled by the Guaranty Trust Company (which measures both production and distribution volume) dropped markedly in September to extend the declining tendency evident pretty much throughout 1957. Its index level for the month was about five per cent below that at the beginning of the year and at the lowest point since April, 1955. Guaranty's index shows a decrease exceeding those of most other indicators, since it contains a correction for price increases and also a "normal" growth factor that causes the calculated level to lag when growth is less than historically "normal."

The picture of sluggishness in October provided by these general indicators is accentuated by other key indices of narrower coverage. Such important series as steel production, freight carloadings, bank loans, and department store sales also exhibited weakness during the month. And weekly data tell much the same story for October. There were some exceptions to the general rule, as is almost always the case. However, they were not sufficiently numerous to remove the overall impression that the economy was beginning to backslide, at least moderately.

GNP Up in Dollar Terms

Gross national product, which purports to be a measure of overall economic activity, apparently came to virtually a flat level during the third quarter of the year,

(Turn to page 128, please)

if you
GRIND,
DRILL,
DRIVE,
CHIP,
LIFT
or BOLT



Chippers and Scalers—Start smoothly, hold easily, have fine throttling control.



Screwdrivers—Reversible and non-reversible types to drive any size threaded fastener to 1/4". "One-Shot" clutches assure proper fastener tightness.



Drills—Reversible and non-reversible in straight or angle models to 3" capacity.



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Grinders—High torque air grinders in straight, angle and die grinder models. Sanders and wire brush machines also available.



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AUTOMOTIVE INDUSTRIES, November 15, 1957

• • INDUSTRY STATISTICS • •

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	Oct. 26	Oct. 19	1957	1956
PASSENGER CAR PRODUCTION				
Hudson			1,345	6,296
Nash			3,561	14,675
Rambler	3,213	3,080	79,521	63,398
Total—American Motors	3,213	3,080	84,427	86,369
Chrysler	2,039	1,725	100,535	82,296
De Soto	2,791	2,717	101,583	75,864
Dodge	5,614	5,613	248,546	152,219
Imperial	567	461	32,322	*
Plymouth	10,975	11,124	585,570	340,748
Total—Chrysler Corp.	22,186	21,640	1,038,556	651,117
Edsel	2,336	1,271	48,057	
Ford	27,357	13,419	1,225,672	1,040,645
Lincoln and Continental	596	344	30,638	40,035
Mercury	2,886	2,061	233,700	194,842
Total—Ford Motor Company	33,175	17,095	1,538,067	1,275,522
Buick	8,141	5,830	315,345	434,263
Cadillac	2,137	832	123,912	115,812
Chevrolet	23,735	16,324	1,173,060	1,299,631
Oldsmobile	5,929	2,909	305,960	350,240
Pontiac	4,396	2,156	269,400	267,993
Total—General Motors Corp.	44,340	29,053	2,187,677	2,467,939
Packard	14	13	4,646	13,269
Studebaker	2,053	2,349	55,187	63,510
Total—Studebaker-Packard Corp.	2,077	2,362	59,833	76,799
Checker Cab	90	85	3,323	3,166
Total—Passenger Cars	105,081	72,315	4,911,893	4,580,914
* Included with Chrysler.				
TRUCK AND BUS PRODUCTION				
Chevrolet	8,222	7,380	262,866	290,636
G. M. C.	1,609	1,606	55,316	76,174
Diamond T	109	124	4,632	4,351
Dixco		60	2,496	3,083
Dodge and Fargo	1,451	1,232	63,729	74,129
Ford	6,853	5,601	281,933	252,479
F. W. D.	17	19	932	1,390
International	2,342	2,354	101,563	114,154
Mack	345	350	14,558	15,370
Reo	100	100	3,940	3,252
Studebaker	186	186	8,067	12,176
White	225	229	11,947	14,804
Willis	369	1,694	50,619	51,195
Other Trucks	70	60	3,500	5,608
Total—Trucks	21,661	21,066	886,321	918,811
Buses	50	65	3,339	3,641
Total—Motor Vehicles	127,012	93,386	5,801,543	5,483,366

1957 TRUCK TRAILER SHIPMENTS

Type of Trailer	Eight Months		
	August	1957	1956
Vans			
Insulated and refrigerated	455	3,206	3,949
Steel	46	450	848
Aluminum	409	2,806	3,101
Semi-insulated	35	408	N.A.
Steel	35	406	N.A.
Aluminum			N.A.
Furniture	131	1,203	1,543
Steel	113	1,092	
Aluminum	18	111	
All other closed-top	2,056	13,797	18,390
Steel	649	6,451	7,847
Aluminum	1,219	7,346	10,543
Open-top	277	2,148	2,865
Steel	149	1,079	1,091
Aluminum	128	1,069	1,474
Total—Vans	2,908	20,822	28,447
Tanks			
Petroleum	275	3,099	3,613
All other	91	1,006	699
Total—Tanks	366	4,105	4,312
Pole, pipe and logging			
Single axle	23	272	445
Tandem axle	41	450	1,077
Total	64	730	1,522
Platforms			
Racks, livestock and stake	313	1,847	647
Grain bodies	95	974	1,000
Flats, all types	453	4,807	6,101
Total—Platform	861	7,428	7,847
Low-bed heavy haulers	196	2,150	2,253
Dump trailers	143	1,466	1,496
All other trailers	277	2,446	1,899
Total—Complete Trailers	4,873	39,149	45,776
Chassis	936	2,900	2,582
Total—Trailers and Chassis	5,809	42,049	48,358

N.A.: Not Available. Source: Industry Div., Bureau of the Census.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	August			Eight Months		Per Cent Change		
		1957	July 1957	August 1956	1957	1956	Aug. over Aug. 1956	Aug. over Aug. 1956	Eight Months 1957 over 1956
1	New England	26,966	39,547	39,287	220,566	240,460	-11.75	-10.99	-8.15
2	Middle Atlantic	95,054	110,442	107,572	795,985	801,482	-13.93	-11.64	-6.99
3	South Atlantic	61,960	65,691	72,596	522,179	546,214	-5.68	-14.65	-4.40
4	East North Central	115,662	127,159	131,237	1,014,705	1,026,534	-9.04	-11.87	-1.16
5	East South Central	24,647	26,072	27,619	198,226	207,338	-4.70	-10.04	-4.39
6	West North Central	46,455	45,340	52,426	358,291	362,399	+2.46	-11.39	-1.13
7	West South Central	46,244	52,318	56,043	363,683	360,793	+7.79	-12.35	+6.81
8	Mountain	18,277	18,231	16,374	137,276	137,642	+25	-53	-27
9	Pacific	84,362	87,464	73,164	474,578	486,952	-19.39	-29.67	-2.94
Total—United States		491,839	543,264	568,329	4,105,978	4,191,604	-9.47	-13.46	-2.05

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Aris., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

1957 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb.* and less		10,001-14,000 lb.		16,001-19,500 lb.		20,001-26,000 lb.		Over 33,000 lb.		Total
	1957	1956	1957	1956	1957	1956	1957	1956	1957	1956	
First Quarter	139,575	36,996	9,187	39,434	16,509	11,533	10,296	9,085	274,567		
Second Quarter	137,091	45,692	11,961	51,060	22,489	13,032	9,963	10,538	301,808		
Total—Six Months	276,666	84,688	21,118	90,494	38,998	24,565	20,251	19,615	576,395		
July	45,020	13,099	3,061	15,074	7,655	5,130	3,275	2,541	94,924		
August	43,388	12,950	3,063	13,121	6,783	4,459	2,297	2,297	89,150		
September	29,064	8,618	1,873	7,337	5,059	4,293	3,285	2,388	62,087		
Total—Nine Months—1957	394,207	119,555	29,135	126,026	50,505	34,447	29,870	28,811	822,556		
Total—Nine Months—1956	328,762	161,555	31,180	153,686	62,686	44,426	32,333	**	534,574		

* Prior to January 1, 1957, vehicles below 10,001 lbs., G.V.W. were grouped "5,000 and less" and "5,001-10,000 lb."

** Included with 26,001-33,000 lb. group.



1958

Autronic-Eye Features...

driver-operated control



...transistors



There's brand new sales appeal in Guide's new driver-controlled Autronic-Eye! And for General Motors Car Dealers, it means new profit potential. A new sensitivity adjustment allows the driver to control how soon the "Eye" dims his lights . . . makes it possible to adjust, on the spot, for varying highway situations. Use of transistor in the power amplifier enables it to operate with full effectiveness in all weather conditions. These new and easy-to-see benefits will produce results from the simplest demonstration. And the importance of automatic dimming, with the brighter four-headlamp systems, will make the 1958 Autronic-Eye easier than ever to sell!



Guide Lamp

... BRIGHTEST NAME IN LIGHTS

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AUTOMOTIVE INDUSTRIES, November 15, 1957

AIR BRIEFS



By RALPH H. McCLARREN

Supersonic Flight Anniversary

Ten years ago, October 14, 1947, man made the first faster-than-sound flight. Captain (now Lt. Col.) Charles F. Yeager broke the so called "sound barrier" in the experimental rocket-powered Bell X-1 at Edwards Air Force Base, Calif.

Remarkable advances have been made since Yeager's flight a decade ago. Our Air Force has in service today fighter aircraft which fly faster than Mach 2 (1320 mph). A bomber, the Convair B-58, which flies as fast as the fighter, is now in limited production. And it was only a few months ago that a current production-line Navy fighter made a non-stop flight across the U. S. at an average speed of 1015 miles per hour.

From what is in production today—what can we expect on the 20th anniversary of the first supersonic flight? Research aircraft such as the experimental X-1A and X-2 have already flown as high as 126,000 ft and at speeds of 2260 mph. By 1967 we should see manned fighter aircraft capable of flying at Mach 10 (6600 miles per hour), 10 times the speed of sound at 40,000 ft.

Earth Satellites

Thinking about high speed flight of manned aircraft—a possible 6600 miles per hour by 1967—consider what we can expect in the way of speed in flight to outer space. Two satellites are orbiting around the earth at about 18,000 mph. To reach the moon a rocket

must have an initial velocity of about 25,000 mph. Such a speed is required to break away from the effects of the earth's gravity force.

The other day we were asked about the immediate danger of a satellite carrying an atomic bomb which might be dropped on any large city in the U. S. We weren't at all concerned. Because the atom bomb when ejected from the satellite would become just another satellite unless it was forced backward from the satellite, thus causing it to slow down. Then it would fall into the earth's atmosphere and be consumed long before it could reach the surface.

The same is true with ICBM's (intercontinental ballistic missiles). Means must yet be developed to prevent their being consumed by the air like a shooting star or meteorite. And presently two large companies have contracts to develop equipment to solve the air re-entry problem in order to perfect a military useful ICBM. This and many other important and necessary developments are being undertaken and sponsored by our military services to insure the free world nations having the strongest deterrent to prevent WW III.

Naca Research Advances

Last month we attended a once-every-three-year inspection of the National Advisory Committee for Aeronautics Lewis Flight Propulsion Laboratory in Cleveland. This \$100 million research facility employing 2700 scientists, engineers and technicians is primarily engaged in investigation

of aircraft powerplant problems, including the special aerodynamics of high speed flight propulsion. Started in 1941 it is one of three laboratories operated by NACA. The others are the Langley Aeronautical Laboratory started in 1917 near Hampton, Va.; and the Ames Aeronautical Laboratory, on which construction started in 1939 near San Francisco.

Studies and investigation at the Lewis Laboratory presently include fuels, combustion, propulsion system installation, engine component design, controls, cooling, high temperature materials and lubrication. A few of its recent contributions to aeronautical science include supersonic inlets for jet engines, transonic compressors, high energy fuels, turbine cooling, jet afterburners and crash-fire inerting system.

Among the lecture-display types of events arranged by the Director of the Laboratories, Dr. Edward R. Sharp were the following:

Aircraft Noise Reduction—Experiments were shown with jet engine exhaust nozzles of different shapes which materially reduce the noise of jet engines. This combined with means to decrease the jet stream velocity will do much toward producing adequate and economical noise suppression.

Propulsion Research for Hypersonic Flight—This area of flight concerns speeds greater than 3300 mph, and high temperature is the dominating problem. NACA has built a special rocket research

(Turn to page 142, please)

PIONEER ALUMINUM INC.

announces new

921-T DC

CAST ALUMINUM TOOLING PLATE

UNIVERSALLY ACCEPTED
FOR PRECISION LOW COST
TOOL ENGINEERING IN ALL
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Direct Chilled 921-T Cast Aluminum Tooling Plate is here, in sizes up to 60 inches wide, 192 inches long and 12 inches thick. Made exclusively by Pioneer Aluminum Inc., the new material is manufactured under processes which control solidification and provide greater density, less porosity and higher mechanical properties to augment the characteristics of standard 921-T.

Pioneer 921-T Cast Aluminum Tooling Plate meets every precision tooling requirement, and at lower cost. Its stability, versatility and workability save money and man-hours, being easily sawed, tapped, milled or welded. All Pioneer Cast Aluminum Tooling Plate* is guaranteed within $\pm .005$ " in thicknesses over $\frac{3}{4}$ ". Write or call any Pioneer distributor for details, prices and engineering data.

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1957 Motor Vehicle Registrations Up 3.5%

By Marcus Ainsworth

MOTOR vehicle registration, by the end of the 1957 registration year, will have reached 67,767,000, a gain of about 3.5 per cent over 64,494,725 vehicle registrations during 1956. In addition to the registered vehicles, there are in the neighborhood of 785,000 publicly owned vehicles, those belonging to the Federal, State and local governments, giving an estimated grand total for all vehicles of 67,552,000.

Eighty-four per cent, or 56,038,000, of the registered vehicles will be passenger cars, a gain of 3.6 per cent over the 54,066,619 cars registered during 1956. Trucks and buses will account for 10,729,138 vehicles, an increase of 2.9 per cent over the 10,428,106 registered in 1956. These trucks and buses will represent 16 per cent of all registered vehicles.

California will lead the nation in vehicle registrations of 6,725,000, surpassing the New York state registrations of 4,770,400 by nearly two million. Texas will be in third place with 4,054,900 registrations,

(Turn to page 140, please)

Forecast of 1957 Motor Vehicle Registrations

As of the end of the Registration Year

State	Passenger Cars			Trucks and Buses			Total Motor Vehicles		
	1957	1956	Per Cent Change	1957	1956	Per Cent Change	1957	1956	Per Cent Change
Alabama	870,140	822,289	+ 5.8	199,295	193,106	+ 2.7	1,069,435	1,015,375	+ 5.2
Arizona	377,090	348,331	+ 7.9	96,300	92,815	+ 2.9	473,390	441,146	+ 7.7
Arkansas	429,804	414,942	+ 3.6	197,090	194,612	+ 2.1	626,894	609,554	+ 4.7
California	5,880,000	5,643,771	+ 4.2	845,000	806,720	+ 4.5	6,725,000	6,450,491	+ 4.2
Colorado	627,000	601,864	+ 4.2	177,000	166,050	+ 5.3	804,000	767,914	+ 4.4
Connecticut	946,000	935,922	+ 1.2	105,000	103,566	+ 1.4	1,051,000	1,039,488	+ 1.2
Delaware	120,800	118,031	+ 2.1	34,100	33,219	+ 2.6	154,900	151,250	+ 2.2
District of Columbia	172,000	175,880	- 2.2	19,500	21,608	- 9.6	191,500	197,488	- 3.0
Florida	1,656,574	1,501,117	+10.3	278,459	250,966	+11.0	1,935,033	1,752,083	+10.4
Georgia	1,075,000	1,014,807	+ 6.0	281,000	243,919	+ 2.9	1,356,000	1,258,726	+ 8.4
Idaho	249,600	236,778	+ 3.0	87,000	94,307	+ 3.2	336,600	331,085	+ 1.3
Illinois	3,060,000	2,879,068	+ 2.7	430,000	419,277	+ 2.5	3,490,000	3,298,345	+ 2.7
Indiana	1,955,000	1,892,143	+ 3.3	410,000	406,066	+ 1.0	2,365,000	2,298,209	+ 2.8
Iowa	982,000	970,635	+ 1.3	217,500	214,458	+ 1.4	1,199,500	1,185,093	+ 1.3
Kansas	830,000	812,239	+ 2.2	280,000	253,511	+ 2.6	1,110,000	1,065,750	+ 2.3
Kentucky	885,000	848,136	+ 4.3	215,500	207,848	+ 3.7	1,100,500	1,055,984	+ 4.2
Louisiana	960,200	799,969	+ 7.5	202,400	200,896	+ 0.7	1,162,600	1,000,879	+ 6.2
Maine	276,000	271,730	+ 1.6	72,000	71,795	+ 0.3	348,000	343,525	+ 1.3
Maryland	894,676	848,321	+ 5.4	142,454	139,600	+ 2.0	1,037,130	987,921	+ 5.0
Massachusetts	1,478,000	1,425,422	+ 3.6	186,700	185,034	+ 0.9	1,664,700	1,610,456	+ 3.2
Michigan	2,813,136	2,732,956	+ 2.9	384,225	380,773	+ 0.9	3,197,361	3,113,729	+ 2.7
Minnesota	1,202,438	1,140,731	+ 5.4	286,410	242,224	+ 5.6	1,488,848	1,382,955	+ 6.9
Mississippi	461,000	447,553	+ 3.0	173,000	180,447	- 4.1	634,000	628,000	+ 1.0
Missouri	1,280,000	1,219,376	+ 2.5	317,000	313,200	+ 1.2	1,597,000	1,532,576	+ 2.2
Montana	244,000	236,825	+ 3.0	101,000	166,001	+ 1.0	345,000	352,826	- 2.4
Nebraska	503,000	500,069	+ 0.6	152,000	150,110	+ 1.2	655,000	650,179	+ 0.7
Nevada	106,384	104,880	+ 1.4	30,515	28,823	+ 5.9	136,899	133,703	+ 2.4
New Hampshire	190,000	169,503	+12.1	37,000	36,699	+ 0.8	227,000	206,202	+10.1
New Jersey	1,923,400	1,880,000	+ 3.4	271,000	258,000	+ 5.0	2,194,400	2,138,000	+ 2.6
New Mexico	276,000	267,539	+ 7.2	81,500	85,494	+ 2.0	357,500	353,033	+ 1.3
New York	4,258,000	4,243,867	+ 0.3	512,400	525,795	- 2.6	4,770,400	4,769,662	None
North Carolina	1,258,200	1,206,478	+ 4.1	283,600	280,232	+ 1.2	1,541,800	1,486,710	+ 3.6
North Dakota	212,600	206,289	+ 2.0	103,000	96,309	+ 6.9	315,600	302,598	+ 4.0
Ohio	3,380,000	3,226,406	+ 4.8	424,000	408,360	+ 3.8	3,804,000	3,634,766	+ 4.6
Oklahoma	808,500	789,476	+ 2.5	285,200	248,836	+ 2.6	1,093,700	1,038,312	+ 5.3
Oregon	729,500	723,221	+ 0.9	72,200	70,268	+ 2.7	801,700	793,489	+ 1.0
Pennsylvania	3,440,600	3,356,967	+ 2.4	991,000	940,987	+ 5.3	4,431,600	4,297,954	+ 3.1
Rhode Island	280,800	277,000	+ 1.4	38,700	37,400	+ 3.5	319,500	314,400	+ 1.6
South Carolina	653,300	621,489	+ 5.1	141,000	139,955	+ 0.7	794,300	761,444	+ 4.3
South Dakota	240,000	236,795	+ 1.4	96,000	84,772	+ 1.4	336,000	321,567	+ 4.5
Tennessee	972,400	940,673	+ 3.3	220,700	216,158	+ 2.1	1,193,100	1,156,831	+ 3.1
Texas	3,240,000	3,115,525	+ 4.0	814,800	773,657	+ 5.3	4,054,800	3,889,182	+ 4.3
Utah	296,000	282,357	+ 4.8	67,800	64,548	+ 4.7	363,800	346,905	+ 4.9
Vermont	128,800	128,800	+ 2.1	16,800	15,716	+ 6.9	145,600	144,516	+ 0.8
Virginia	1,136,100	1,075,900	+ 5.6	221,000	219,752	+ 0.6	1,357,100	1,295,652	+ 4.7
Washington	1,000,000	954,536	+ 4.8	215,500	200,202	+ 3.9	1,215,500	1,154,738	+ 4.4
West Virginia	480,600	423,969	+13.4	130,800	106,598	+22.7	611,400	530,567	+15.2
Wisconsin	1,210,000	1,168,948	+ 1.8	240,800	238,811	+ 0.9	1,450,800	1,407,759	+ 3.6
Wyoming	125,400	121,894	+ 1.5	53,000	52,484	+ 1.0	178,400	174,378	+ 2.3
Total	56,038,064	54,066,619	+ 3.6	10,729,138	10,428,106	+ 2.9	66,767,192	64,494,725	+ 3.5



NOW!
An amazing
new development
in tubing...gives steel
unusual new properties
of corrosion resistance
for use in critical
applications

**NEW ZINC I.D. TUBING RESISTS CORROSION—
RETAINS OUTSTANDING STRENGTH, DUCTILITY
AND ECONOMY OF STEEL!**

You can now use economical steel tubing for applications formerly restricted to more expensive materials. Through an exclusive and inexpensive process, GM Steel Tubing makes available tubing that withstands corrosion and yet retains the important strength and economy of steel.

Outstanding new GM Steel Tubing with Zinc I.D. has a corrosion-resistant metallic coating which is non-porous, uniform in thickness and sufficiently ductile for manufacturing operations. The coating does not yield a volume build-up of corrosion deposits. The tubing is completely annealed and the coating entirely intact when delivered. Investigate the immediate savings possible with GM Steel Tubing with Zinc I.D. Write direct or call your GM Sales Engineer. And watch for important tubing advances of the future to take shape at GM Steel Tubing.



GM STEEL TUBING by



ROCHESTER PRODUCTS DIVISION OF GENERAL MOTORS, ROCHESTER, N. Y.

40 Countries Represented at World Metallurgical Congress

(Continued on page 65)

given the other, was mentioned. The action is a combination of grinding and electrolytic etching. It is reported to be especially successful in the cutting of honeycomb laminates, which because of their structure must be fabricated with care after laminating.

Vacuum processes, such as the vacuum melting of steels and non-ferrous alloys and vacuum evaporation of metals, are getting increased attention. Vacuum melted metals show superior properties because of the reduction of adsorbed gases, and vacuum evaporation and deposition of metals offers a method for coating metals with a protective film of another metal in competition to electroplating and hot dipping.

Extrusion of metals, both cold and hot, is progressing in complexity of forms possible. Explosive forming, another development in the aircraft industry, makes use of the pressure wave of an explosion to produce great deformation of the metal against a female die.

Because good formability usually requires a metallographic structure different from that which provides best strength and wear or corrosion resistance, some means of change of structure, such as heat treatment, will probably always be required in industry. Chemical processes affecting the composition of the surface layers of the metal, carburizing, carbonitriding, and nitriding, are more and more a part of the process of change of structure. These processes will be studied with the help of radio isotopes. Better instrumentation, to permit closer control of temperatures during heating cycles; control of quenching speed and of surface reactions; and improved control of carbon potential and of carbon transfer value were some of the developments predicted. Induction heating may be combined with carburizing, and treatment with fluid hydrocarbons or heat by glow

discharge in partial vacuum were suggested as future possibilities.

It was brought out that the world has been building up its steelmaking capacity since the years that marked the outbreak of World War II at such a rate that the industrial nations have nearly doubled their per capita capacity in that time. In the United States, it now stands at 1500 lb; more than 800 lb in Sweden; the same in Great Britain and West Germany; 500 to 600 lb in Canada, Australia, Belgium, Netherlands, and France; and more than 200 lb in Italy and Japan. Most of the expansion has taken place since 1945, when capacity increased from 30 to 40 per cent. In the United States the steelmakers began to realize in 1945 that the open pit workings in the Lake Superior area, which had supplied 85 per cent of all our ore for the past 50 years, would be exhausted within 10 years, and they began a search for other sources and other processes.

Beneficiation, the concentration of low grade ores, has cost the industry a billion dollars in research and development, and plants are already in operation with a capacity of 10 million tons of ore yearly. Location of ore bodies in foreign countries have introduced the Labrador and Quebec deposits, Morocco, Liberia, Brazil, Peru, Chile, and Venezuela. Technical improvements in steelmaking include increased efficiency and size of the blast furnace, improved charging procedure in the open hearth furnace, and the possibility of returning to a converter somewhat like the early Bessemer. Specialty steels, such as tool steels, may be vacuum melted in the future.

High-melting nonferrous metals, such as titanium, have become of major importance in the aircraft industry. Uranium, thorium, and zirconium are applied to atomic energy uses.

At the Metals Exposition, which

occupied 18 per cent more space than last year, Westinghouse demonstrated its new method for preparing laboratory-sized ingots of such metals as zirconium, titanium, niobium, and molybdenum, difficult to produce in pure form because of their high melting points and chemical reactivity. The process suspends the compressed metal powder inside a copper coil in which the current reverses itself a million times a second, floating the metal charge in the field created. Temperatures of 4500 to 5000 F are reached within half a minute. The entire coil operates in an atmosphere of helium or argon.

The A.S.M. conferred Distinguished Life Memberships upon these industrialists: Joseph Block, president, Inland Steel Co.; Roger M. Blough, chairman, U. S. Steel Corp.; John Thompson, chairman, International Nickel Co.; Eugene Grace, chairman, Bethlehem Steel Co.; and I. W. Wilson, chairman, Aluminum Co. of America. Luncheon speaker Hunter also will be so honored.

Award of the Gray Iron Founders' Society was given by J. Scott Parrish, Jr., Society president and president of the Richmond Foundry and Manufacturing Co., to Harold R. WarSmith, of the Jeffrey Manufacturing Co., Columbus, O.

Goodyear Tire Curing Plant Described as "Automatic"

Goodyear Tire & Rubber Co. describes its new \$7.5 million tire curing plant at Los Angeles as the "world's most fully automatic" facility of its kind.

The new plant, now in operation, houses 88 tire curing presses with 176 molds. Uncured tires are brought on chain conveyors from tire builders located in adjoining sections of the factory. As the tires move along the press line, they are transferred by hand to racks for temporary storage, or placed on other conveyors from which they are automatically transferred to the curing molds.

When cured, the tires are automatically ejected onto a conveyor system that carries them to finishing, inspection and shipping stations.

NEW SUNVIS 916

SAME OIL
AFTER 3 YEARS
OF HARD SERVICE

Comparative Tests Prove . . .

Sunvis 900 Oils have years of useful life under severe operating conditions

Versatile, long-lasting Sunvis® 900 oils are especially made to provide superior lubrication at high temperatures and in the presence of moisture. *They keep maintenance costs low.*

Time and again, when checked against new-oil specifications, used Sunvis 900 oils prove themselves fit for many more years of continued service, with no loss in performance features.

For example: The 3-year-old sample above was used in an injection molding machine operated for 40-48 hours per week at temperatures between 100 and 125 F. To see how the used oil compares with its original specifications look at the following table.

Specifications	New Sunvis 916	Sunvis 916 After 3 Yr*
API gravity at 60 F	30.5-32.5	30.3
Flash, open cup, deg F, min	400	400
Fire, deg F, min	460	460
Viscosity, SUS at 100 F	150-160	173.0
Viscosity index	90	90
Neut. number	0.10	0.05
Color, ASTM	1-1.5	3.5

*Typical Test

HOW TO GET MORE INFORMATION

Call your Sun representative, or write for Technical Bulletin No. 35, Sun Oil Company, Philadelphia 3, Pa., Dept. I-7.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY
PHILADELPHIA 3, PA.

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IN CANADA: SUN OIL COMPANY LIMITED, TORONTO and MONTREAL

Tru-Stop Brakes

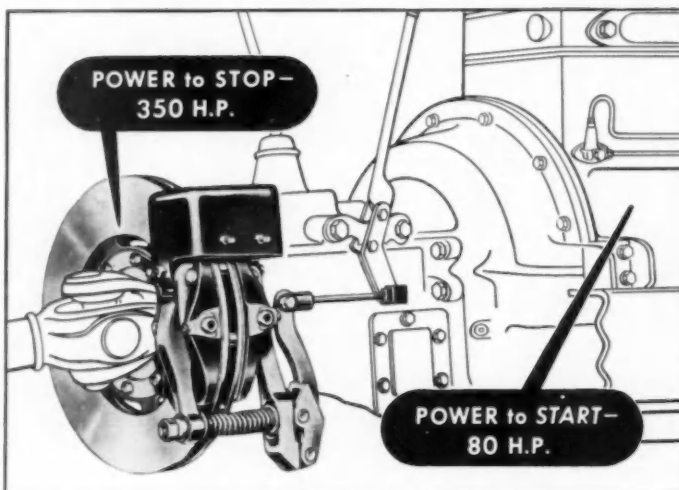
Meet Every Heavy-Duty Safety Requirement

OFFER POSITIVE PROTECTION
AGAINST RUNAWAY OR PARKING
ACCIDENTS—AT LOWEST COST

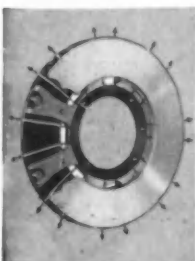
HERE IS WHY:

They have surplus power required for emergency service—no dangerous self-energizing

TRU-STOP Heavy-Duty Emergency Brakes are not only excellent parking brakes. They serve as a complete, independent and fully reliable braking system. Operating on the propeller shaft they enable the driver to continue on safely in the event of service brake failure. TRU-STOP brakes have the surplus braking capacity to be used repeatedly as an auxiliary to service brakes.

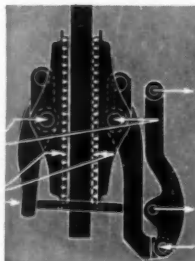


Brakes actually do more work than the engine in terms of horsepower. Where it takes 80 HP to accelerate to 20 miles per hour, it takes 350 HP to make a safe stop from 20 miles per hour within required limits



Ventilated to throw off heat

Brake efficiency depends on ability to throw off intense heat—rapidly. Discs of TRU-STOP brakes are exposed to the air even during the braking operation. Ventilated design circulates air between the disc plates.



Give uniform brake pressure

Disc of TRU-STOP brakes is "squeezed" between the flat surface of the shoes. Effort applied to brake lever operates front and rear lever arms simultaneously. Pressure is exerted on the center of each shoe. Entire lining surface is in contact.

FOR SAFE, ECONOMICAL, HEAVY-DUTY BRAKING WITH MAXIMUM LIFE AND MINIMUM MAINTENANCE

TRU-STOP Brakes are used on a great variety of mobile and stationary equipment

SUCH AS—

Motor cranes
Road rollers
Dump trucks
Power dividers
Cooling tower fans
Oil well pumps
Cold header presses
Scrubbing machines
Wire rope stranders
Fork lift trucks
Motor scrapers

Tractors
Graders
Diamond core drills
Electric locomotives
Oil well servicing rigs
Railway inspection cars
Shapers
Power take-offs
Winches
Motor shovels

Tractor loaders
Conveyors
Hard rock drill positioners
Mine locomotives
Power presses
Railway power ballisters
Cable tool spudders
Aerial tram cars
Tension wire stringers

We will be glad to answer any questions or give you more detailed information about TRU-STOP Heavy Duty Emergency Brakes. Send for

Catalogs
DH-33
and
DH-530



Automotive and Aircraft Division AMERICAN CHAIN & CABLE

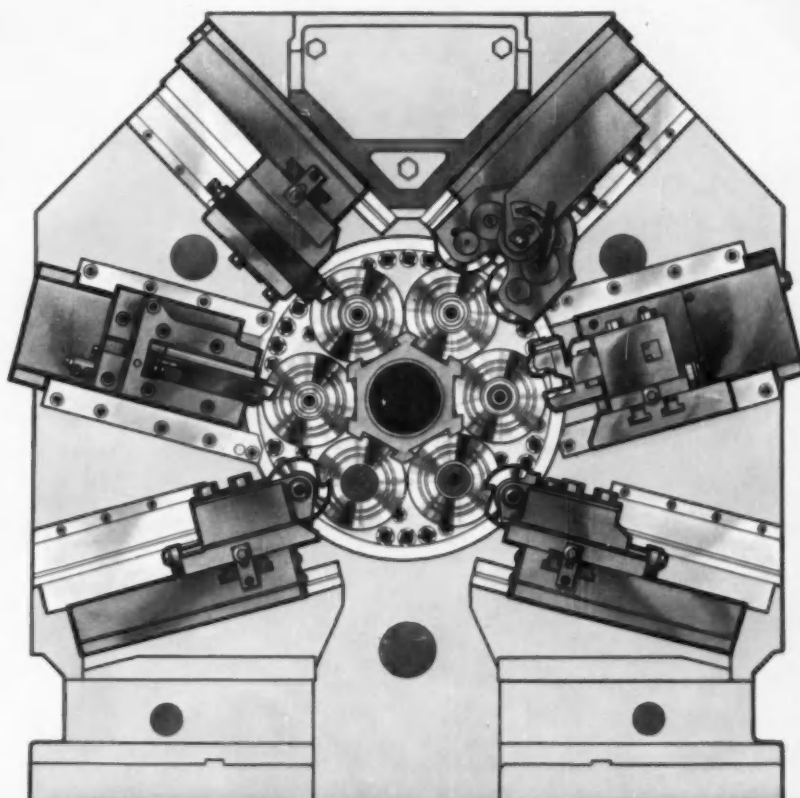
601 Stephenson Building, Detroit 2
2216 S. Garfield Street, Los Angeles 22 • Bridgeport 2, Conn.



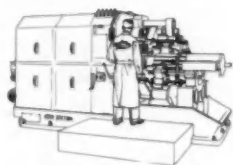
Look at New Britain's
**new cross slide
arrangement**



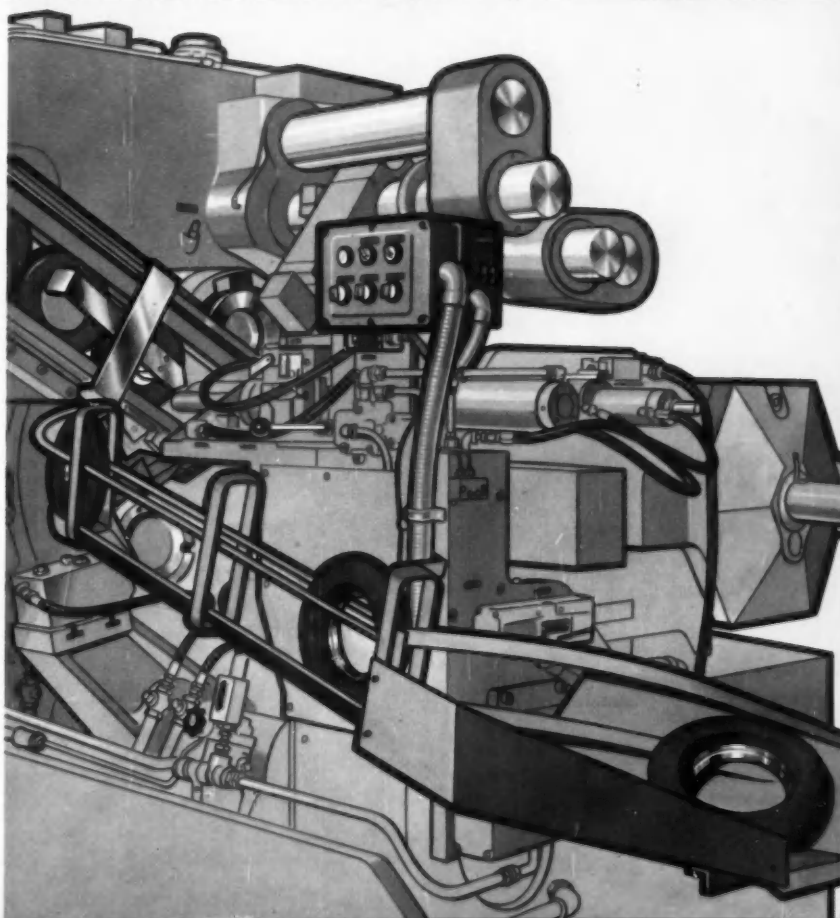
Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

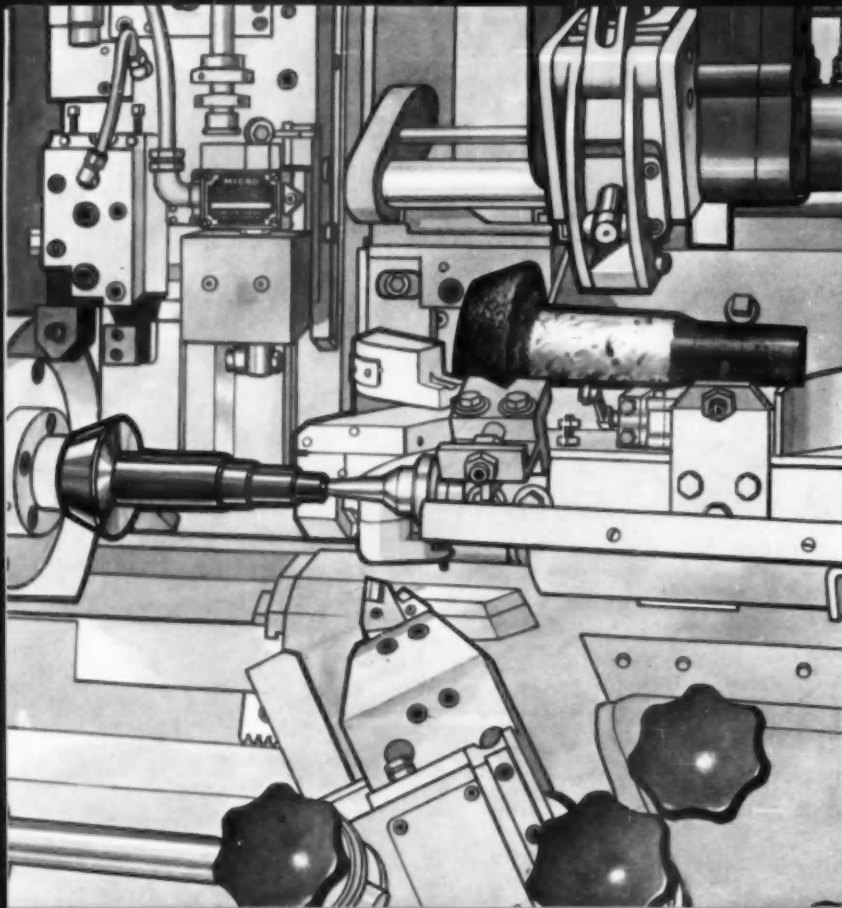


Look at New Britain's
**open-end
chucker design**



Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

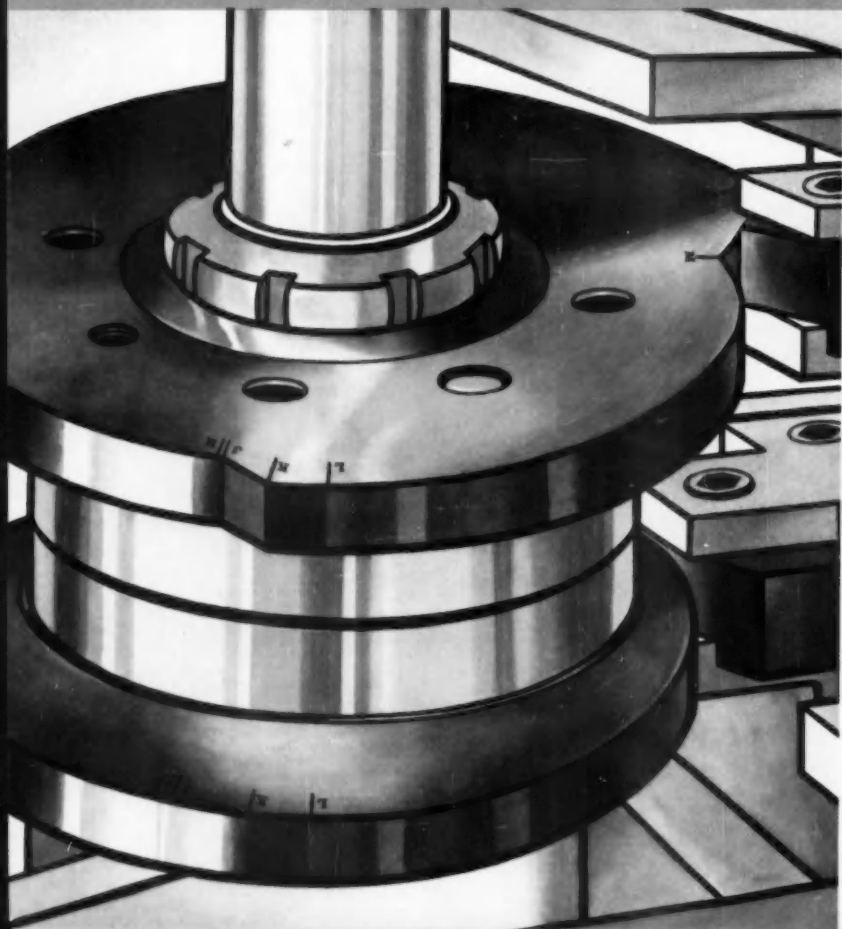




Look at
Automatic Loading on
New Britain +GF+



This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.



Look at New Britain's
cam-controlled
boring machine



When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

YOLOY "E" IS ON THE JOB

Gives Increased pay load, strength and durability to Standard Steel's gasoline trailers

When Standard Steel Works of North Kansas City, Mo., built this modern 7000-gallon, 3-compartment conical gasoline transport, they wisely chose Youngstown's Yолоy "E" high strength-low alloy steel.

It's a tough, shock- and wear-resistant steel that allows designers to increase structural strength, reduce dead weight—increase payload capacity. Furthermore, Yолоy's excellent corrosion-resistance gives

longer life to these Standard Steel trailers.

Youngstown Yолоy Steels are available in sheets, plates, strip, shapes, hot rolled and cold finished bars as well as seamless and continuous weld tubular products.

Call your nearest Youngstown District Sales Office today for full information and service engineering on the proper Yолоy Steels for your particular requirements.



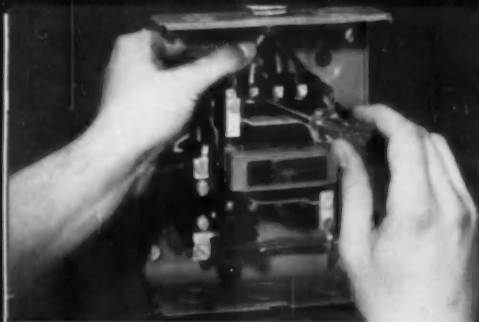
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yолоy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities



Write for these free technical pamphlets covering the Yолоy Family of Steels:

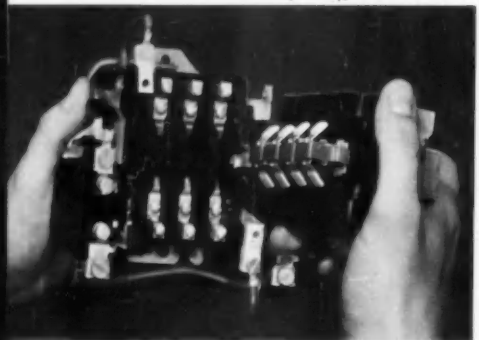
- YOLOY "E" High Strength Low Alloy Steel-standard applications
- YOLOY High Strength Low Alloy Steel-special applications
- YOLOY "S" Higher Strength Steel for increased service life
- YOLOY "C" Corrosion Resistant Grade for deep forming
- YOLOY PIPE Continuous Weld for corrosion resistant applications



NEW **GREATER WIRING SPACE**
Wrap-around cover—removable enclosure sides make wiring much easier.



NEW **SNAP-SLIDE CONSTRUCTION**
Principal components quickly disassembled for easier inspection and maintenance



NEW **"VERTICAL" CONTACTS**
Continuous dependable operation of new starter—even in dusty atmospheres



NEW **ADJUSTABLE OVERLOADS**
Overload trip setting can be adjusted plus or minus 15% of nominal heater rating.

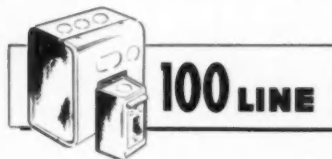
General Electric announces **NEW** Size 0 and 1 Magnetic Starters— 42% Smaller in Size

General Electric now offers a new line of Size 0 and 1 magnetic starters that is 42% smaller than previous open forms and is built to the new NEMA ratings. The new starters with "snap-slide" construction provide easier inspection and maintenance because principal components snap or slide together. Completely new and radically different in design, this line of starters offers:

- wrap-around cover with spring latch—easily removed without tools for inspection
- removable sides for greater accessibility
- straight-through wiring speeds installation
- pressure-type terminals make wiring easy
- vertically-slanted contacts give higher tip pressure, reduce possibility of contact welding
- long life "kick-off" spring provides clean break of contacts in any mounting position
- strongbox coil with Mylar* insulated start wire for longer coil life
- overload relays adjustable for $\pm 15\%$ of trip setting
- nine field modification kits for greater flexibility
- new maximum NEMA ratings up to $7\frac{1}{2}$ hp at 220 volts and 10 hp at 440 volts

Two additional features of the new magnetic starter are extremely quiet operation and lower inrush requirements of the coil. Sound absorbing material around the magnet lowers the operating noise level. Lower coil inrush current will allow you to use a 47% lower rated control transformer with this starter—saving you money and mounting space.

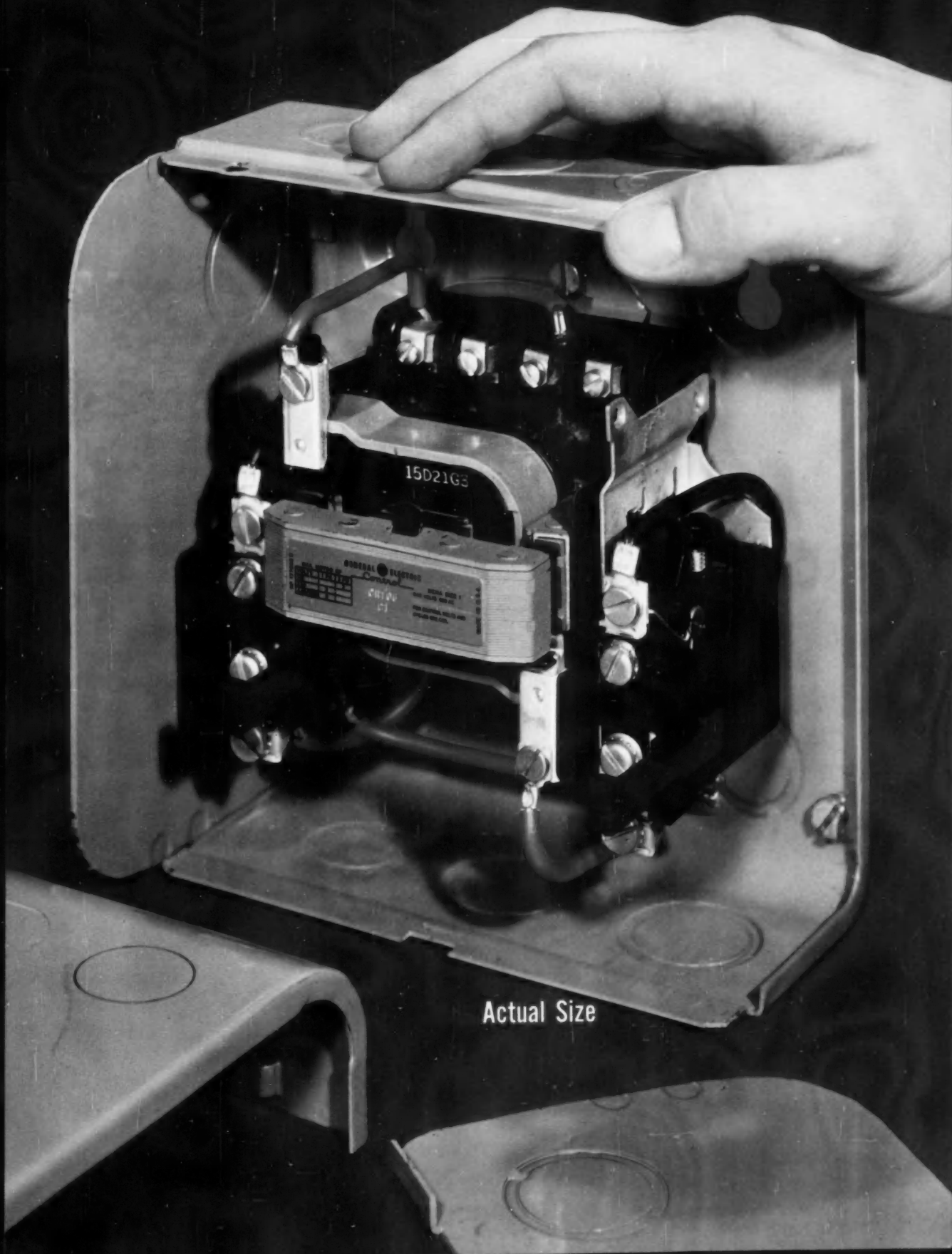
Size 0 and 1 General Electric starters are available now in non-reversing, combination, reversing and multispeed forms. Contact your nearest General Electric Sales Office or Distributor, or write Advertising Section 731-13 for the 20-page bulletin describing the line. Ask for GEA-6611. General Electric Company, Bloomington, Illinois.



*Trade-mark of DuPont Co.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**



Actual Size

If it moves...

Timken-Detroit Brakes can stop it!



New lightweight... Fabricated steel brake shoes weigh many pounds less than cast shoes. Binding or freezing up is eliminated because double web construction permits limited area fit with one piece cam rollers. Wear areas of the webs are heat treated for long life.

Unit-mounted... All brake parts are mounted on the spider for compactness. Efficiency is higher and correct cam shaft alignment is assured with close coupled cam shaft and chamber bracket.*

"P" SERIES POWER BRAKES

designed for heavy-duty automotive service

Here is a brake that gives longer, trouble-free service for trucks, trailers, and all types of industrial and road equipment. These heavy-duty "P" Series Brakes are easy to maintain in service. Simplicity of design is the keynote—with brake, air chamber, and cam shaft all mounted as a unit.

The outstanding features of the Timken-Detroit "P" Series Brakes give increased economy and performance. Operating temperatures are lower and lining life longer because open-type spiders assure good internal ventilation and rapid cooling. Timken-Detroit

"Econo-liners" are tapered to provide greatest thickness where greatest lining wear occurs.

A constant-life "S" type cam assures uniform application of brake shoes for maximum control and immediate response. Brake adjustments are quick with easily accessible slack-adjusters. Long wearing nylon bushings assure smooth operation with minimum maintenance.

"P" Series Power Brakes are available in a complete range of capacities and sizes to fit every operating requirement.

*"P" Series Brakes are also available with inboard chamber mounting for special applications.

©1957, RS&A Company

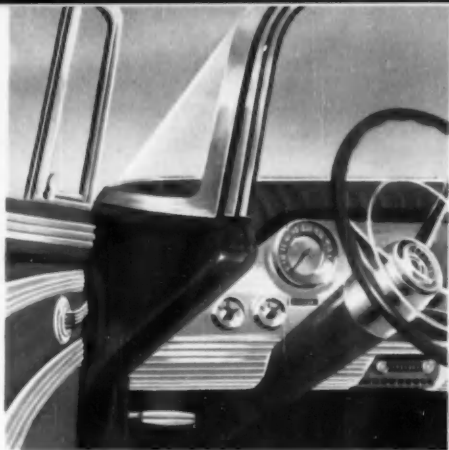
Another Product of...

**Rockwell Spring
and Axle Co.**

For every industrial, agricultural or automotive
application where braking is required!



BRAKE DIVISION
Ashtabula, Ohio



indoors or out—
the accent is **STAINLESS**
the meaning is **PROFIT**



mouldings of **Superior Stainless**

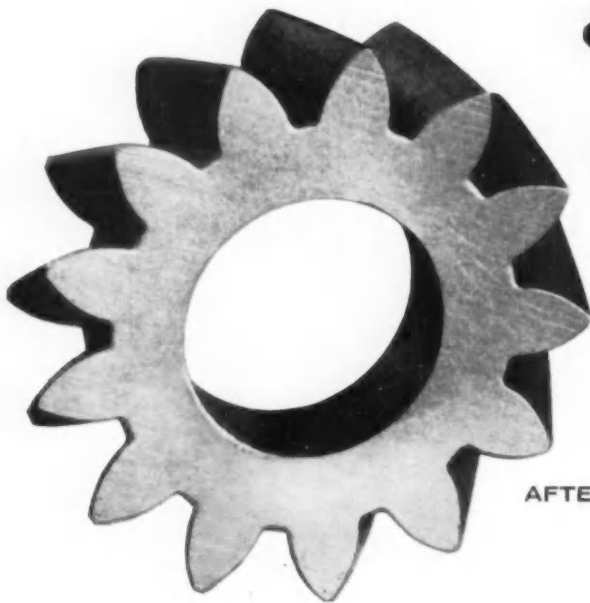
STRIP STEEL



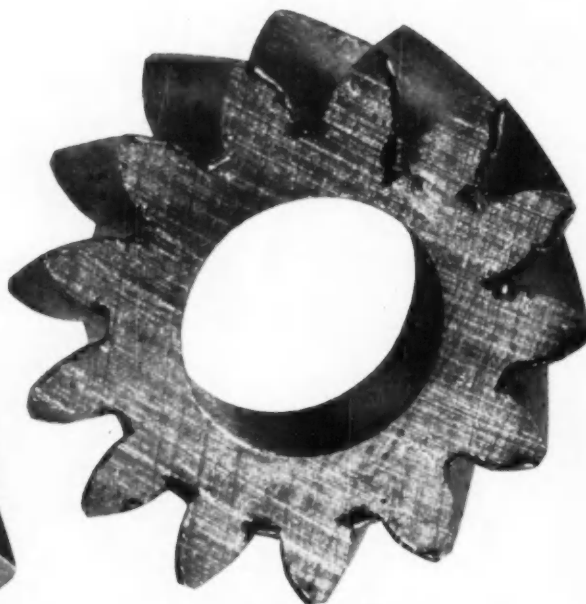
The bright world of applications for mouldings of Superior Stainless tells the story fast: *wherever these mouldings are used, profit is part of the picture!* Profit in fabrication, through Superior's uniform ease of working . . . profit in sales, from outstanding value appeal . . . profit in customer satisfaction, which builds more business! • Let us send you the Superior Stainless Strip Steel Brochure.

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA





AFTER BRUSHING



BEFORE BRUSHING

How trouble-free transmissions get that way

... with OSBORN Brushmatic® Method

WHEN even the smallest chips or burrs get into an automatic transmission—there's trouble.

That's why leading automotive producers *depend* on Osborn Power Brushing to finish gears and other transmission parts.

At the same time, sharp corners and surface junctures are blended to reduce stress concentrations... the cause of many gear failures. Osborn Power Brushing does the job fast... efficiently at mass production rates.

This is the kind of job Osborn Power Brushing can do for *you*—no matter what you manufacture. An Osborn Brushing Analysis, made in your plant at no obligation, will show you how. Write us. *The Osborn Manufacturing Company, Dept. E-58, Cleveland 14, Ohio.*



**FAST, EFFICIENT
REMOVAL OF
BURRS** and blending of surface junctures on gears and hundreds of other metal parts is handled automatically on Osborn's Brushmatic® Machines.

Osborn Brushes 

Write for your copy of the
100-page Osborn Catalog 210-C
and the 20-page
Brushmatic® booklet.

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primary automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, etc. This list is for the period Sept. 27 to Oct. 30, inclusive.

ALLIS-CHALMERS MFG. CO., Tractor Group, Milwaukee, Wis.
Crawler tractor—1 ea.—\$12,107

AMERICAN BOSCH ARMA CORP., Springfield, Mass.
Repair parts for Diesel engines, various—\$675 ea.—\$33,813

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Wheel assy., main, 56x16, for B-52D aircraft; brake assy., main (for 56x16 wheel), for B-52D aircraft—\$1,586,111
Wheel assy., main (49x17 for KC-135A aircraft); brake assy., main (49x17 wheel) for KC-135 aircraft—\$1,171,859

CHRYSLER CORP., Highland Park, Mich.
Trucks, cargo, 1-ton, special power wagon, T-137 (Modified)—\$459,625 (Modification)

CHRYSLER MOTOR CORP., Washington, D. C.
Trucks—7 ea.—\$17,709

CONTINENTAL AVIATION & ENGINEERING CORP., Toledo, Ohio
Spare parts—\$47,370

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Engines, Packette Model PE 150-6—\$2,050,509
Spare parts—\$58,347

CURTISS-WRIGHT CORP., Caldwell, N. J.
Modification kits applicable to propellers and propeller assemblies—\$2,802,565

Spare parts and assemblies applicable to aircraft propellers—\$1,461,366 & \$59,335 (two awards)

CURTISS-WRIGHT CORP., Wood-Ridge, N. J.
Modification of aircraft engines—\$158,400

DOUGLAS AIRCRAFT CO., INC., Long Beach, Calif.
Modification of C-124C-3 MTU—\$412,320

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.
Repair parts for Nike System—\$70,507; repair parts for Nike System—\$58,955

FAIRCHILD ENGINE AND AIRPLANE CORP., Long Island, N. Y.
J44-R-20B engines—\$1,359,533

FAIRBANKS, MORSE & CO., Chicago, Ill.
Dismantle, modernize, rebuild Model 38A6-3/4 Diesel engine—\$54,476

FAIRBANKS MORSE & CO., Fair Lawn, N. J.
Repair parts for Diesel engines, various, no specs or dwgs available—2789 ea.—\$91,738

FIRESTONE TIRE AND RUBBER CO., Los Angeles, Calif.
Tires, 7 items—\$33,769

FLIGHT ENTERPRISES, INC., Windsor Locks, Conn.
MATS-SAM of C-54 type aircraft—\$130,400

Progressive aircraft reconditioning cycle and modification of C-118 type aircraft under the MATS-SAM concept—\$2,395,332

Progressive aircraft reconditioning cycle and modification of C-121 and drop-in-maintenance on C-121 and C-54 type aircraft—\$150,000

Progressive aircraft reconditioning cycle and modification of C-118 type aircraft—\$201,200

THE GARRETT CORP., Phoenix, Ariz.

Air turbine starters—\$292,169

GARWOOD INDUSTRIES, INC., Wayne, Mich.

Kits, for bulldozer, M8—571 ea.—\$73,602

GENERAL ELECTRIC CO., Schenectady, N. Y.

R & D inline exhaust systems—\$95,205

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.

T56-A-7 turbo-prop engines for service test—\$330,000

Overhaul of J35-A35 and A47 engines—\$4,166,052

GENERAL MOTORS CORP., Cleveland, Ohio

Repair parts for Diesel engines, various—2060 ea.—\$27,992

GENERAL MOTORS CORP., Detroit, Mich.

Truck, pickup, 1/2 ton—(Modification)—\$20,852

GENERAL MOTORS CORP., Pontiac, Mich.

Bus, motor, integral, 4x2, 41 passenger—9 ea.—\$314,506

Automotive spare parts, MDAP requirements—various—\$35,126 (Modification)

B. F. GOODRICH CO., Dayton, Ohio

Wheel assy. for C-124 aircraft—\$674,720

HARLEY-DAVIDSON MOTOR CO., Milwaukee, Wis.

Motorcycles—36 ea.—\$42,964

HAYES AIRCRAFT CORP., Birmingham, Ala.

Contractual maintenance, inspection, repair as necessary, rework, flight test, refinishing and preparation for delivery of flyable H-19 type U. S. helicopters—20 ea.—\$5,174 Unit Price

LOCKHEED AIRCRAFT CORP., Burbank, Calif.

T-33A aircraft, spare parts, special tools, ground handling and test equipment and data—\$11,273,600

MARTIN CO., Baltimore, Md.

Modification, essential repair, inspection, testing of B-57 aircraft—\$500,000

MOHAWK RUBBER CO., Akron, Ohio

Tire, 12.00x20, 14 PR T&B, M&S, tread—697 ea.—\$44,433

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.

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PRECISION TOOL CO., INC., Memphis, Tenn.

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SOUTHERN AVIATION CORP., Shreveport, La.

Overhaul of Government-owned Army aircraft engines, used on H-23 type aircraft—311 ea.—\$550 unit price

SPARTAN AIRCRAFT CO., Tulsa, Okla.

Overhaul of Government-owned aircraft engines—50 ea.—\$78,750

UTICA-BEND CORP., Utica, Mich.

Overhaul of J-47 aircraft engines—\$1,473,000

WILLYS MOTORS INC., Toledo, Ohio

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Truck mounted audio visual unit—2 ea.—\$11,441

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Simmonds Fuel Injection System

(Continued from page 70)

to these injection nozzles. In order to inject over a 180 degree period, the pump is driven at engine crankshaft speed. Since the normal high output engine operates on the four-stroke cycle and only requires an intake charge once during every two revolutions of the crankshaft, this drive speed would result in fuel being supplied at twice the required frequency except for the fact that a valving mechanism has been included which permits each plunger to deliver fuel to two different engine cylinders on alternate crankshaft revolutions.

For instance, on a six-cylinder opposed engine with normal firing order, three plungers are used, the first supplying cylinders 1 and 4, the second cylinders 3 and 2 and the third supplying cylinders 5 and 6.

The 580 Series fuel injection system (See Fig. 2) is designed for aircraft and automobile markets.

The present line of 580 systems is adaptable to any engine, with any number of cylinders, having a displacement of approximately 100 cu in. per cylinder or less. While present applications for engines larger than this are being handled by the 570 Series, Simmonds will shortly be offering a second size of 580 units to also accommodate the larger bore engines.

One of the major technical features of the 580 Series is the absence of the temperature bulb formerly used to sense intake air temperature in some portion of the intake manifold. In the new design, by virtue of having two manifold connections run from the pump's capsule chamber to different portions of the intake manifold, a flow of intake air is thus brought about through the chamber, allowing the capsule to sense not only manifold pressure but also the temperature of this air.

The absence of the temperature bulb, together with product design refinements, permits economical production of the unit.

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Multiplying Markets Seen for Magnesium

(Continued from page 72)

ing alloys which can compete with other metals in the 300 F to 700 F range will be needed. It is in this moderate temperature range that magnesium is capable of giving the designer a distinct advantage, provided newer alloys will maintain the strength/weight ratio of magnesium at these temperatures.

Some of the typical mechanical

TABLE I—TYPICAL MECHANICAL PROPERTIES—SAND CASTINGS

Alloy	Room Temperature			400 F			500 F			600 F		
	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E
AZ92A-T6	40,000	23,000	2	17,000	11,000	36	11,000	8,000	33	8,000	5,000	49
EZ34A-T6	23,000	16,000	3	21,000	11,000	20	18,000	10,000	31	12,000	8,000	50
HK31A-T6	31,000	16,000	6	24,000	13,000	18	22,000	12,000	20	19,000	11,000	21
HZ32A-T6	31,000	17,000	5	19,000	13,000	30	16,000	12,000	38	12,000	8,000	38

TABLE II—TYPICAL MECHANICAL PROPERTIES—EXTRUSIONS AND FORGINGS

Alloy	Room Temperature			400 F			500 F			600 F		
	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E	U.T.S.	Y.T.S.	% E
AZ31B-F	40,000	28,000	17	17,000	9,000	65	15,000	5,000	55	10,000	90
AZ61A-F	49,000	33,000	14	21,000	14,000	42	13,000	8,000	64	8,000	5,000	70
ZK60A-T5	53,000	44,000	11	15,000	12,000	84	8,000	4,000	177



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properties of magnesium casting alloys are given in Table I. The alloys listed are all commercially available and are presently being used in air-frame structures. For use in future designs, a casting alloy showing a 15,000 to 20,000 psi yield strength in the 500 F to 600 F range would be very useful.

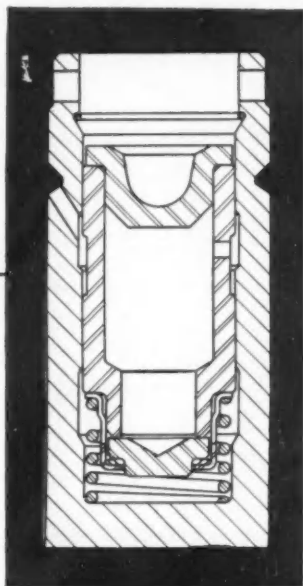
Magnesium alloy extrusions should play an important role in future air-frame design. The extrusion process becomes important under the following conditions: where it is impossible to produce by rolling; when it is not economical to machine from a casting; when a combination of shapes are joined in an assembly; where an extrusion can be cut from lengths to replace individual forgings; and where scrap loss from machining is excessive.

Magnesium forgings are used in applications where stiffness, pressure tightness, and uniform quality throughout the part are essential. Table II lists the typical mechanical properties of several commercial magnesium alloys presently available for extrusions and forgings alloys. As it can be readily noticed, they do not exhibit suitable elevated temperature properties. However, an experimental magnesium extrusion alloy (HM31-XA) shows very encouraging elevated temperature properties.

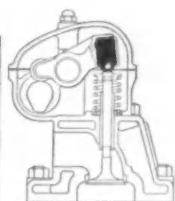
At present, magnesium alloys hold a slight advantage on a strength to weight and stiffness to weight ratio basis (compared under favorable conditions). However, only through a concerted and continued development program can they maintain this advantage in the future.

(Turn to page 124, please)

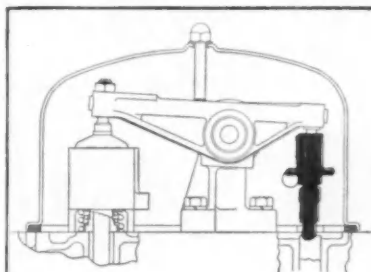
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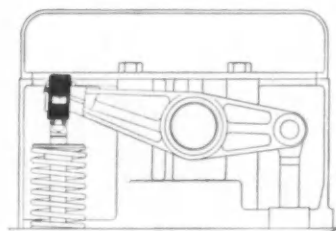
CHICAGO SPRING-LOADED FLAT VALVE HYDRAULIC TAPPET



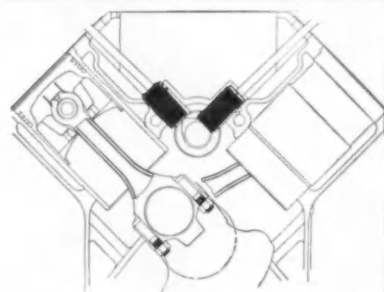
INSERT TYPE ROCKER ARM UNIT



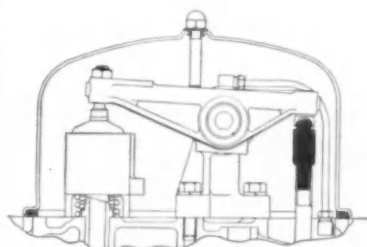
PUSH ROD TYPE FOR COMPRESSION RELEASE APPLICATION



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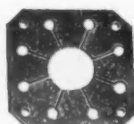
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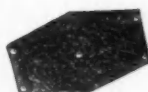
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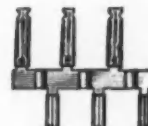
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Markets for Magnesium

(Continued from page 120)

Chemical Milling of Magnesium

By HUGH H. MILLER
Technical Assistant

Turco Products, Inc.

VIRTUALLY all of the commercially available magnesium alloys have been chemically milled with success. This process is rapidly gaining acceptance in the aircraft and missile industries. Most airframe companies are using it to some extent on current models and are designing an increasing number of parts specifically for the chemical milling process.

A new concept or approach to designing airframe parts is not only possible, but mandatory, in order to obtain the maximum benefit from the process. Since forming prior to milling is easier, less expensive forming dies are required, and the need for costly "check and straighten" work is largely eliminated.

"Chem-Mill" is the process used to shape metals and alloys to an exacting tolerance by chemical removal or deep etching of the parts, rather than by conventional mechanical milling or machining operations. The amount removed or depth cut is controlled by immersion time in the milling solution. Location of the milled areas on a part is controlled by masking or protecting certain portions from the milling solution. The finished part is in many cases directly comparable to and competitive with machine milled parts. The four major steps in the magnesium Chem-Mill process are: 1) Cleaning; 2) Masking; 3) Etching; and 4) Demasking.

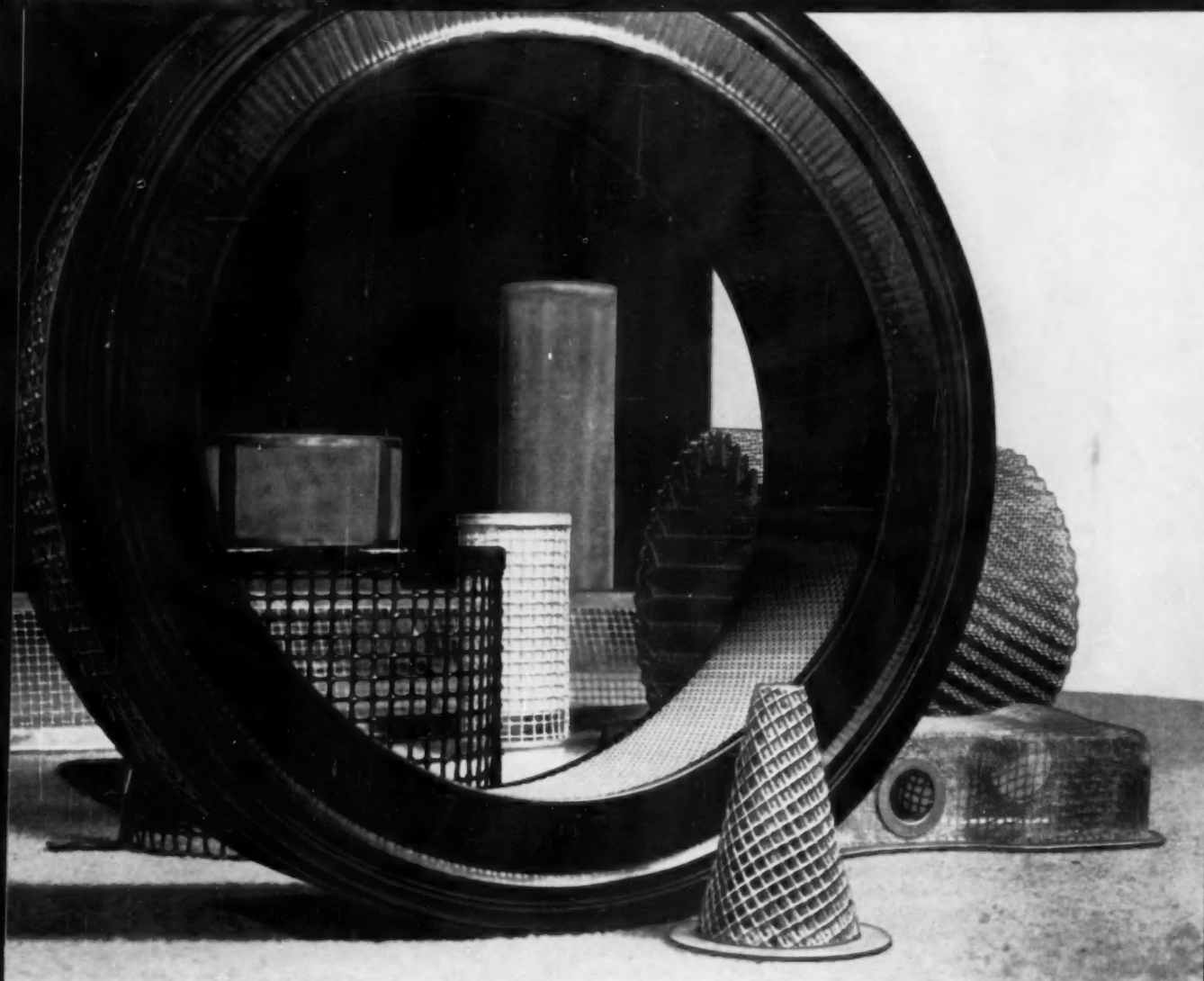
The tapering of sheets, extrusions, or formed sections may be readily accomplished by this process. Various depths of cut may be made on one part by progressively unmasking portions of the part during etching.

Giant Press for Magnesium Extrusions

By K. F. BRAEUNINGER
Manager, Extrusion Dept.

Dow Chemical Co.

Dow Chemical Company's new 13,200-ton German-built extrusion press can be used at pressure stages



How to **USE** wire cloth at lower cost

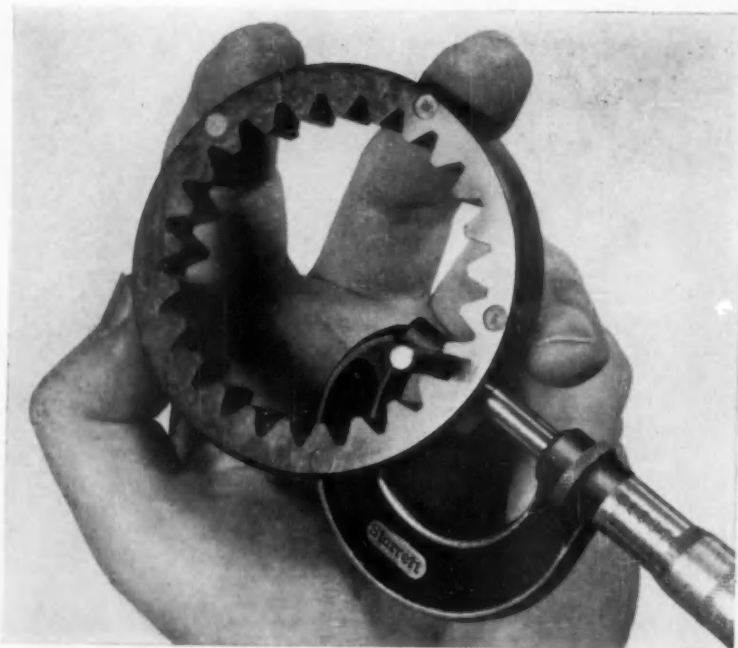
Today many companies are able to make wire cloth components, like these shown here, at lower cost than ever. The answer lies in new services, new developments worked out by the *Reynolds Wire Division* of National-Standard . . . ideas aimed at the more effective, less wasteful use of industrial wire cloth. For example . . .

5 SUGGESTIONS:

1. Check on wire cloth rolls 2 to 8 times normal length . . . for 2 to 8 times as much production in a single run. Fewer shutdowns. Less handling.
2. Consider pre-slit widths, plain or with woven-in reinforcement, as narrow as 1 inch or less, to meet your requirements exactly with minimum handling and waste.
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Performance in withstanding the heat and friction created in automotive transmissions showed remarkable improvement. Molded of a glass-fiber-reinforced compound, Durez 16771, the plastic pump gear showed no performance-affecting wear after 200,000 miles. The same degree of wear was visible in the former part of

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What makes Durez thermosetting phenolics so inviting to engineers in search of new and better materials, lower unit cost, faster assembly, and longer service? *Their properties are available in well-balanced combinations.* Electrically non-conductive, chemically inert, Durez withstands heat and impact, is unaffected by moisture, molds readily to any shape, and needs little or no finishing.

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of 5500, 7700, 10,700 and 13,200 tons. Maximum magnesium billet length is 71 in., maximum extrusion length, 93 ft; finished length stretched maximum, 84 ft. The total length of the press including runout is 250 ft.

The 5500-ton press is capable of extruding a 570-lb ingot under a pressure of 50,000 psi. At 100,000 psi, a pressure considered a prerequisite to bring about the flow of metal for many alloys and shapes, the maximum ingot weight that can be extruded is 220 lb. The ingot diameter on the 5500-ton press is 11½ in.

The 13,200-ton press will permit the use of 1160-lb ingots at 100,000 psi. With an ingot weighing 2500 lb and 25 in. in diameter, a pressure of 50,000 psi can be obtained. At any given pressure, production capacity of the big press is from four to five times as large as that of the 5500-ton press.

The 13,200-ton press will enable Dow to produce forging stock up to 18 in. in diameter. The company will eventually be in a position to offer extrusions made on a great variety of presses and container sizes. The smaller presses (up to 5500 tons) will use containers from 2 to 16 in. The big press will have containers of 16, 18, 24¼ and 32 in.

The versatility of an extrusion press in its ability to produce a greater range of sections with no more than a die change, is stimulating interest in the development of parts which have more complicated configuration. Combination of extrusion and forging is a way to make hollow and solid parts which otherwise could only be made by forging with subsequent machining away of up to 90 per cent of the weight of the forging.

General Motors Is Host To Vocational Conference

General Motors was host this month to educational guidance officials from 16 states and the District of Columbia for a four-day conference on training of future scientists, engineers and technicians.

The program was aimed at acquainting guidance people with industrial, research and engineering facilities; employment opportunities, job preparedness, scholarship programs and other factors affecting vocational training. Tours of the General Motors Technical Center, GM Institute, and GMC Truck & Coach Div. were included in the conference schedule.



SS-50U

*U. S. Patent No. 2,789,872

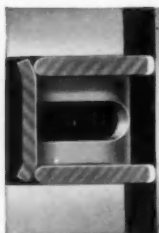
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Circumferential abutment type design makes the ring independent of the contour and depth of piston groove. It exerts its pressure uniformly... conforms more readily to the bore.



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As the overhead valve V-8 engine grew more prevalent during the 50's, it became apparent that carbon steel oil rings—no matter how modified or improved—could not be made to meet the necessary oil control and performance requirements imposed by this new kind of engine. What was needed was a totally new kind of ring, made from a totally new kind of material.

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Revolutionary in material, revolutionary in design, revolutionary in performance, this new kind of ring is now standard on two of

America's leading cars. And judging from the unprecedented acceptance this ring has enjoyed from automotive engineers, you will soon find it in the majority of tomorrow's cars. The reason is this simple: it does things no carbon steel ring can do. For example...

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THE BUSINESS PULSE

(Continued from page 98)

to judge from preliminary estimates released by the Council of Economic Advisers. In dollar terms, GNP is estimated to have risen to a new record of \$439 billion at a seasonally adjusted annual rate, some \$4.7 billion above the level in the preceding quarterly period. It appears, however, that nearly all of this gain re-

flected higher prices, with aggregate output in real terms merely being maintained.

The rise, moreover, was dominated by higher personal consumption expenditures, and without the vigorous rise in these, the real volume of overall activity would almost certainly have slipped. Certain other components, which had previously been making a contribution to expansion, either flattened out or receded slightly. And with September experience in

retail trade having been somewhat disappointing, the question now arises as to whether personal consumption outlays also may be losing their buoyancy.

FRB May Loosen Credit

Less favorable economic conditions have brought into active discussion the question of whether a change in Federal Reserve policy is in process. No definitive answer can be given, of course, since monetary authorities do not publicize policy decisions. But press reports from generally responsible sources indicate that the Federal Reserve has decided to be a little less restrictive with respect to the availability of credit, while still holding fundamentally to a policy of restraint.

Since even a small change could be significant, monetary actions will bear close attention during the next month for clues as to whether there has been an actual change in policy. A change toward more leniency would not guarantee the avoidance of recession, for no one claims that monetary policy is an economic cure-all. But at least it would throw light on Federal Reserve thinking as to the trend of developments.

Outlook for 1958 Still Cloudy

There have recently been additional signs that the capital-goods boom (long one of the principal factors of expansion in the economy) is losing its dynamic quality. Business investment during the third quarter of the year merely held at the plateau previously attained, and the recent falling off in heavy construction contracts and machine tool orders would suggest the possibility of some near-term decline. The appearance in mid-December of the results of the Government's next quarterly survey of plant and equipment spending intentions should clarify the situation. A preliminary estimate for capital outlays in the fourth quarter of this year and an initial estimate for the first quarter of 1958 will be given at that time. They are likely to contain some hints as to whether a significant decrease from the recent plateau is shown for the new year.



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that give stamina to your products

Lamb Electric *fractional* horsepower motors, like the small horses of the famed western-pioneer-day Pony Express, are developed for *stamina*.

Their dependability, and efficiency (optimum weight-size-horsepower ratio) are qualities that result from proper design and careful manufacture by personnel with many years of experience in the small motor field.

May we demonstrate how Lamb Electric Motors can bring these advantages—and also perhaps lower costs—to *your* products?

THE LAMB ELECTRIC COMPANY • KENT, OHIO

A Division of American Machine and Metals, Inc.

In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER **MOTORS**



Radar voltage regulator gear motor.



A rugged high-torque, high-speed motor.



Motor with efficient spur gear speed reducer.

NOW

for the first time

LOW COMPRESSION SET

Butyl "O" RINGS



NEW

Another LINEAR first... a new, low compression-set Butyl Compound for use in "O" Rings. LINEAR Butyl Compound 7806-70 is a seal material that withstands compression set at elevated temperatures without being permanently deformed or losing its resiliency and its value as a seal. Also, Butyl withstands the chemical actions of the non-flammable phosphate esters such as "Skydrol", "Pydraul", "Celluflex" and "Lindol".

YET, PROVEN

Exhaustive tests, under method "B" of the ASTM, show this new LINEAR compound develops only 30 to

40% compression set after 70 hours at 212°F, as compared to the usual 70 to 95% set experienced with previous Butyl compounds. This unusually good resistance to permanent deformation, combined with a tensile strength of 2000 psi and an elongation factor of 275%, make this material an outstanding one for all "O" Ring applications and other molded shapes where Butyl rubber's excellent qualities are desirable.

Whenever you have a seal problem that is tough to handle—look to LINEAR for an answer. Write, or ask the local representative for complete information on LINEAR's new Butyl Compound 7806-70—today.



"Engineered Production" Service

FOR BROACHING



It takes all 3

American's "Engineered Production" Service

... gives the broach user the complete three part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

THE JOB — Broaching the I.D. and four inverted angular helical splines in automotive synchronizer rings.

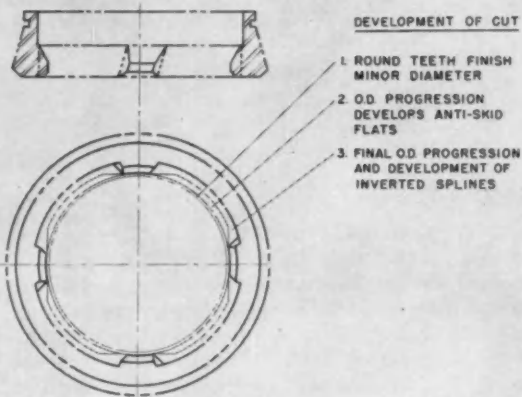
THE RESULT—Two parts are broached at a time in a fully automatic cycle for a total production of 376 pieces per hour.



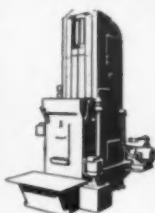
1

PROPER BROACH TOOL DESIGN

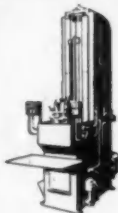
Top quality results on any broaching operation require starting the job with design of the broaching tool itself. American Broach solves this all-important first step by considering stock removal, length and width of cut, finish, tolerances required, etc. Because broach and machine are designed as a team, high quality work and long tool life result. In this job, the broaches which are rotated by a spiral lead bar, are pulled through the parts. Special automatic broach pullers with long shanks and drive keys are geared to the spiral lead bar.



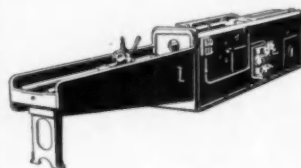
Broaching Tools



Three Way



Single Ram

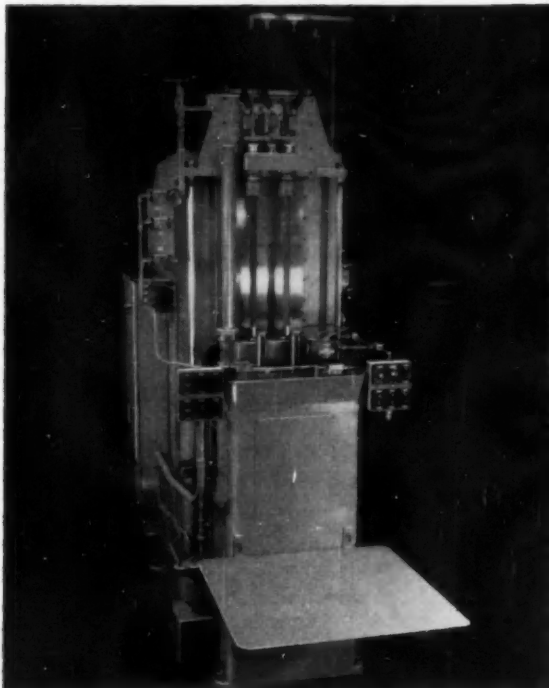


Horizontal

to give you peak broaching performance

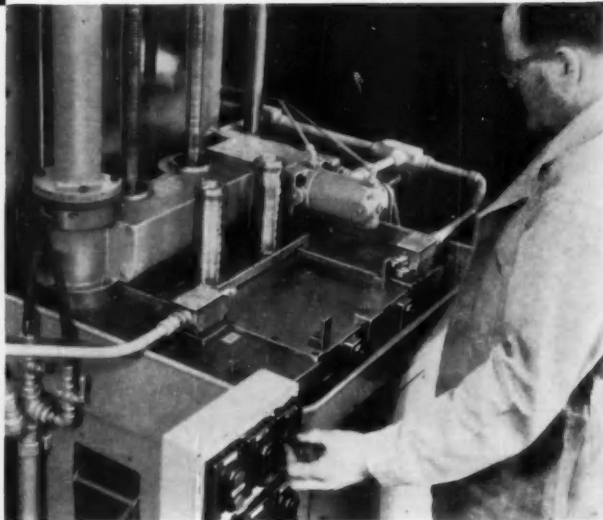
2 SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc., determine the selection of the broaching machine capable of doing the best job. Machine selection follows design of the broaching tool at American, insuring the most practical method. This American two-station pull down machine has a spiral drive unit, consisting of a lead bar and stationary nut geared to a two-station broach puller unit.

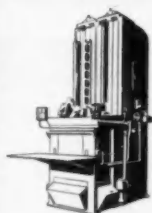


3 EFFICIENT FIXTURING

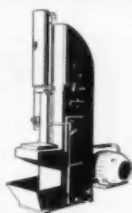
Whatever your parts geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. On this job, operator only has to fill the feed tubes. After broaching, the slide returns to out position and a subslide opens, allowing the finished parts to drop into the discharge chute. Operator skills are not a limiting factor in production since the "skills" are built into the tool, machine, and fixtures.



Get more facts in American's Pull Down Bulletin A220. Write for your free copy today.



Duplex Ram



Presses



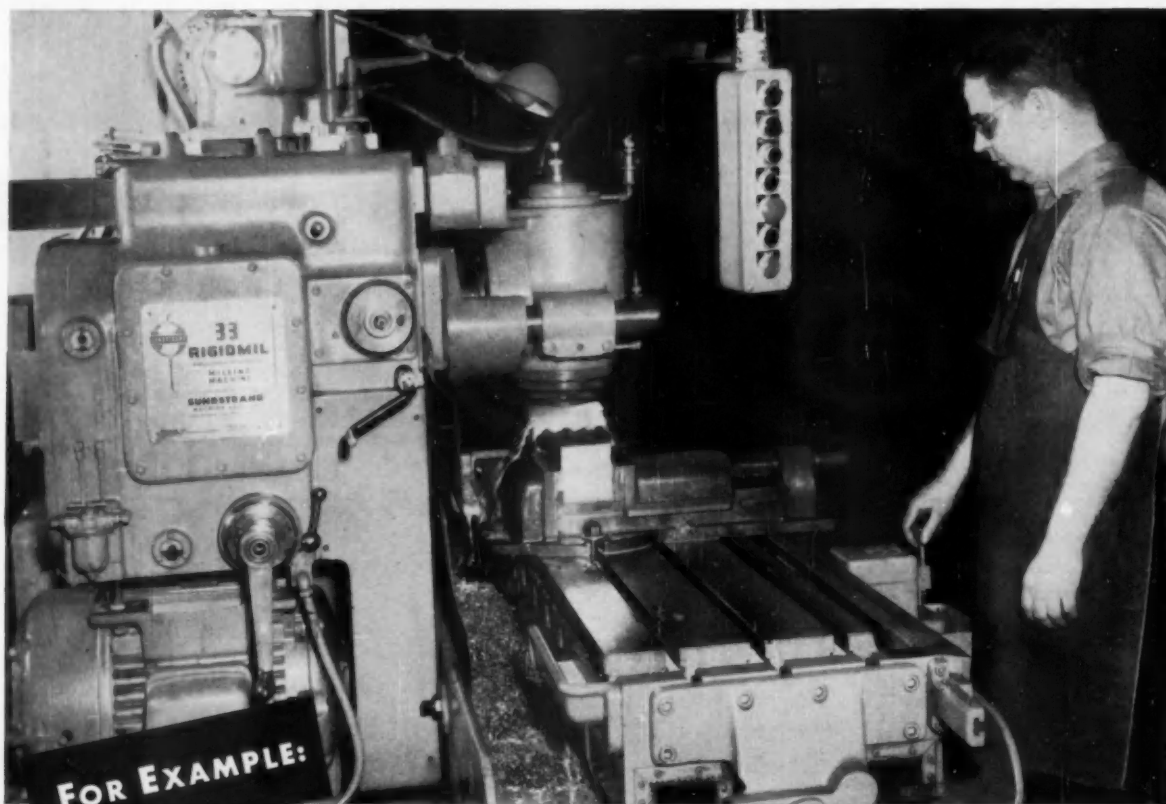
American

BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS

Before you buy any milling equipment see what you get from **SUNDSTRAND!—**



This Rigidmil increased production 50% on small lot jobs

This Sundstrand Rigidmil increased production 50% over former machining methods on hard to machine parts run in small lots. In addition to the increased production, setup time was reduced considerably in face milling extremely tough stainless steel rough forgings for junction blocks used in welding equipment. High horsepower, rigidity, automatic cycles, and the wide range of speeds and feeds of this Rigidmil are all cited as reasons for this substantial production increase.

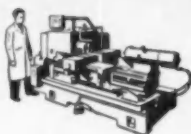
Your job may be like this one or differ in most respects, but, in either case, you can benefit from Sundstrand "Engineered Production." Sundstrand's years of production engineering experience on small, medium, or high production jobs combined with the availability of a complete range of milling machines means you can be sure of getting the machine and tooling that are best suited to your specific job needs.

Sundstrand's record of meeting, and often exceeding, exacting production standards in hundreds of automotive, aircraft, farm equipment, construction machinery, and railroad equipment plants is your assurance that you will obtain the most practical machining method. Send a sample part or print and your production requirements to Sundstrand for an "Engineered Production" analysis.

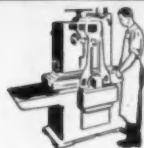


*"Engineered
Production"
Service**
*REG. U.S. PAT. OFF.

AUTOMATIC LATHES



SIMPLEX RIGIDMILS

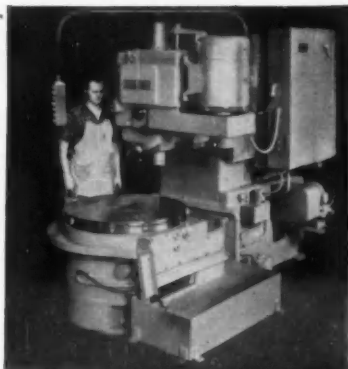


DUPLEX RIGIDMILS



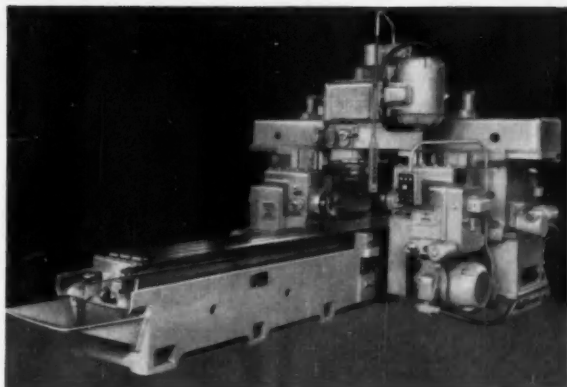


On these pages are several basic Rigidmil designs that, together with Sundstrand "Engineered Production," will give outstanding results on your job. Numerous other combinations of machines, tooling, and heads (both standard and special) offer an almost unlimited number of combinations to meet the *exact* needs of every job.

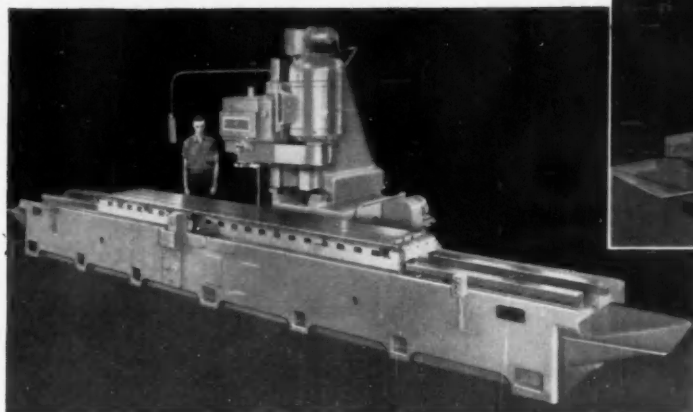
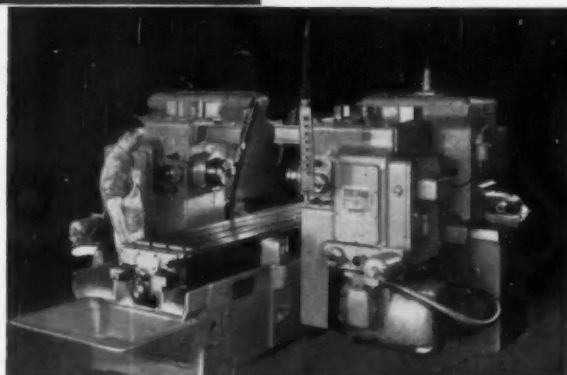


ROTARY TABLE RIGIDMILS—Way-type cross adjustment of spindle head carrier and way-type vertical adjustment to spindle head provide maximum support to cutter for large or small parts.

DUPLEX RIGIDMILS—Fixed or adjustable column types enable opposed faces to be machined with maximum accuracy and economy. Adjustable column machines mount spindle heads on movable columns for cutting rigidity over wide work range.



TRIPLEX RIGIDMILS—Flexibility for handling both wide and narrow parts with no sacrifice in accuracy; three spindle heads—one vertical and two horizontal with individual motor drives—are among the advanced design features offered.



UNIVERSAL RIGIDMIL—Recent addition to Rigidmil line, the universal bed-type machine has both a horizontal spindle head and an all-angle, ram type head, making possible wide range of cuts at all angles.

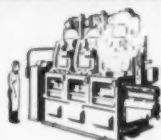
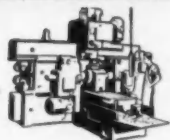
VERTICAL RIGIDMILS—Power vertical adjustment to spindle head, endwise quill adjustment, and cross adjustment to spindle head carrier are features contributing to easy adjustment and simple setup over a wide work range.

Additional Facts on how "Engineered Production" is applied to the complete line of Sundstrand Machine Tools is available in Bulletin 285. Write for your copy today.



TRIPLEX RIGIDMILS

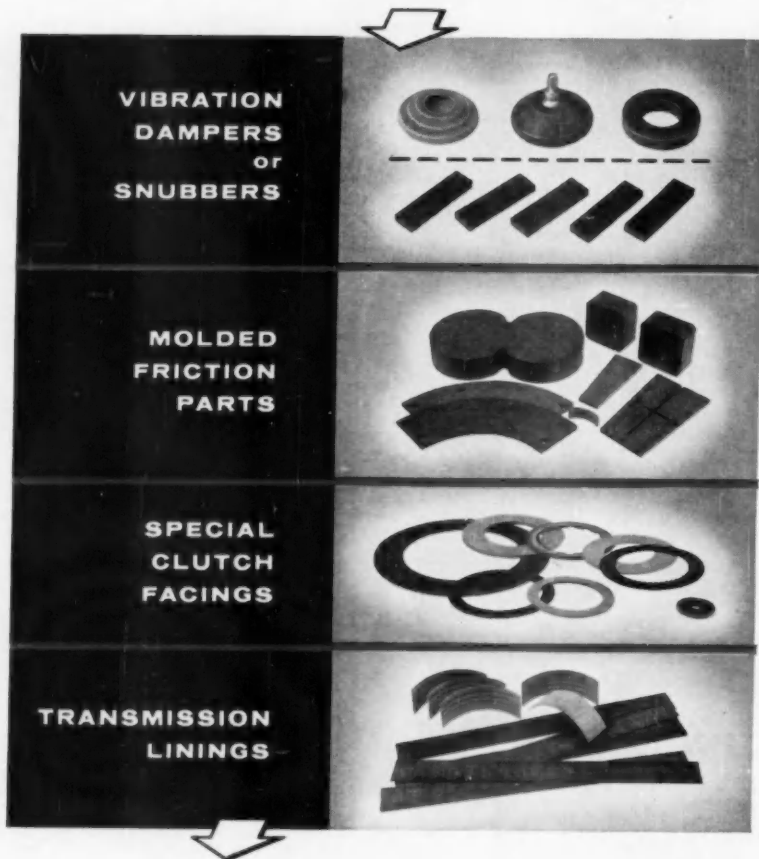
SPECIAL MACHINES



SUNDSTRAND
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2571 Eleventh St. • Rockford, Ill., U.S.A.

let **WORLD BESTOS**
help you
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● World Bestos offers you more than 30 years' engineering and manufacturing experience in the production of molded friction parts. Chances are our immense resources and facilities can supply you with molded parts and friction components—to meet your requirements—at a savings in both time and money.

● Send your blueprints (or samples) for prices and delivery information to WORLD BESTOS, Industrial Products Section, New Castle, Ind., Phone: 2360. Write for free illustrated folder.

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DIVISION OF THE
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Industrial and Automotive Brake Blocks and
 Linings • Transmission Linings • Special Clutch
 Facings • Vibration Controls • Sheet Packing

**London International
 Motor Show**

(Continued from page 59)

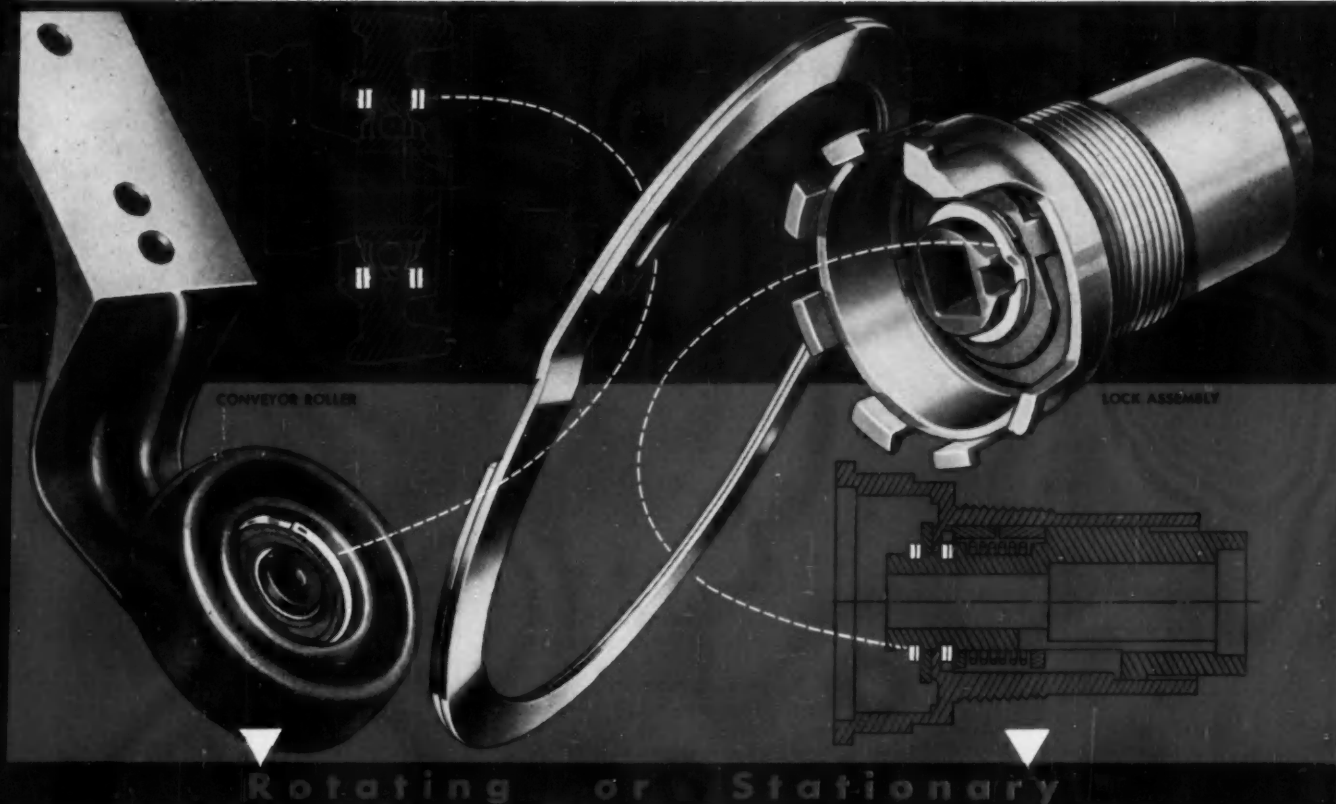
hall presented the Bedford Dormobile Caravan—a conversion of its half-ton panel van by Martin Walter Ltd. It has a hinged plastic roof section that swings upwards to give an interior headroom of nearly seven feet, while a canvas canopy weatherproofs the resultant quadrant. Patented seats that slide, swivel and tilt can be arranged to provide beds, a dining-room suite, or normal passenger accommodation for six people.

This type of multi-purpose vehicle is becoming increasingly popular in Europe, and British Ford has extended its range to include the Thames 8-10 seat station wagon, which was made public after the show. Control is fully-forward, and the 52-hp engine from the Consul sedan is mounted between the two front seats. The Ford cars remain basically unaltered except for some minor changes in styling and trim, although the small Anglia and Prefect are now offered with an inexpensive form of two-pedal control using a centrifugal clutch disengaged by a vacuum servo during gear shifts.

One entirely new car seen at Earls Court was the Lotus Elite sports coupe, embodying a number of advanced design conceptions. Of integral body and frame construction, it has a body shell of plastic reinforced with glass fiber as the main supporting member. Added stiffness is given by the large box-section transmission tunnel. All wheels are independently suspended, the rear ones being carried by a combined coil and strut system, and laterally located by the unsplined half-axles with universal joints at each end.

The Lotus engine is a newly-developed four-cylinder Coventry Climax of 78-cu in. displacement. Details of this are not yet finalized, but output is in the region of 75 hp. Transmission includes a four-speed close-ratio gearbox, and a hypoid final drive with a choice of seven ratios. Weighing

there are hundreds of ways in which Industry uses **SPIROLOX** to solve retaining problems



assemblies retained with *Spirolox* look neater, last longer, use fewer parts, are easier to take apart and put together

Wherever parts rotate, wherever parts are to be secured on shafts or in housings, wherever moving parts must *hold* together—Spirolox Retaining Rings do the job better! Even on rotating assemblies, as shown in the conveyor roller application at left above, Spirolox attains neat, compact, simplified design. The stationary application of a lock assembly (right above) illustrates how Spirolox can be applied in those hard-to-reach places where the retaining ring must operate in a very confined space.

Exclusive Spirolox Design makes possible a variety of applications that is almost limitless. Secret of this design is the patented Spirolox *two-turn construction*, which **ELIMINATES THE GAP** and makes possible a **UNIQUE LOCKING CHARACTERISTIC**. A step or offset, formed in the ring so that the two turns are parallel, *bridges the gap* found in conventional retaining rings. Result: better conformability, even in the most restricted places. The effective locking property of Spirolox is created by a "friction lock", formed under thrust between the two turns. Result: greater holding power to make the ring **STAY PUT** in its groove.

R-0012RT

The success of Spirolox construction proves itself not only in superior operation. It also makes possible easier installation, less-complicated machining, simplified servicing and quicker dismantling of assemblies retained the Spirolox way. These compact spring-steel rings spiral into their grooves easily, saving many man-hours in manual installation. Spirolox Rings adapt easily to fixtures for automatic production line installation. They eliminate costly machining and special tools. Spirolox Rings facilitate maintenance and servicing in the field because they come out at the flip of a screwdriver, ready for re-use. Thus, factory-adjusted or assembled units **REMAIN UNCHANGED**, even after repeated dismantling operations during servicing or repairs.

HANDY, ILLUSTRATED SPIROLOX CATALOG is yours without cost or obligation. It may be your key to simpler, lighter, more compact machinery or parts. If you wish, send us a print of your product and our engineers will point out Spirolox application possibilities. Thompson Products, Inc., Piston Ring Division (Ramsey Corporation) Dept. H, St. Louis 8, Mo.

U.S. Pat. No. 2,450,425 and Foreign Pats. Other Pats. Pend.



the better way

Spirolox

RETAINING RINGS

to hold moving parts TOGETHER!

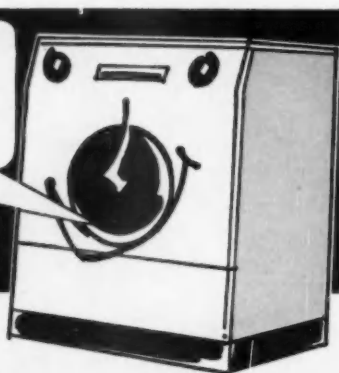
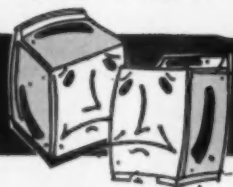
Write
for
Samples

gapless • concentric • requires no special tools • easy-in,

easy-out • re-usable • stays put



"C'mon, take a better grip on yourselves"



Everybody knows that

SEMS BY Everlock®

End Fastening Problems for Good!

Appearance and quality are vitally important to consumer acceptance of any appliance. So is the durability with which the mechanical components are fastened together.

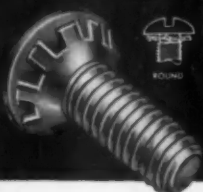
Sems by Everlock literally help your products to "take a better grip on themselves" and provide greater resistance to loosening through vibration, shock and heaviest use.

Sems by Everlock firmly grip both the fastener and the product with full chisel edge locking action... an Everlock exclusive... bulldog bite actually tightens when subject to vibration.

SEMS by Everlock Save Time and Money 5 Ways...

1. **Cut Costs** by eliminating separate handling of screw and washer.
2. **Simplify Ordering** by reducing the number of items in your plant inventory.
3. **Eliminate Waste** due to lost or dropped lock washers.
4. **Eliminate Rejects** due to omitted lock washers or faulty fastening.
5. **Fast Delivery** on a wide range of types and finishes.

SEMS by EVERLOCK



Exclusive Everlock Chisel Edges firmly grip both the fastener and the product!

Everlock Sems are available in a wide range of types and sizes. Ordering "Sems" is not enough, only Everlock Sems have the exclusive, full chisel edge-locking action.

Other Everlock fasteners that feature the exclusive full chisel edge-locking action include Free Lock Washers, Locknuts and Terminals.

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Sales Co.
Philadelphia, Pa. | |
| Richard C. Dudek
Beverly Hills, Calif. | Kenneth D. Delaney
Dayton, Ohio | A. G. Kavalier
Milwaukee, Wis. | Oregon Indust. Factors
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| Plastic & Metal
Components
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Moline, Illinois | Howard N. Clark
Rochester, N.Y. | |
| | C. W. McNeil, Inc.
Houston, Texas | J. Ramsay Reese, Inc.
New York, N.Y. | | |



only 1200 lb, the Elite is 3 ft 10 in. high, 12 ft long, and has a 7 ft 4 in. wheelbase.

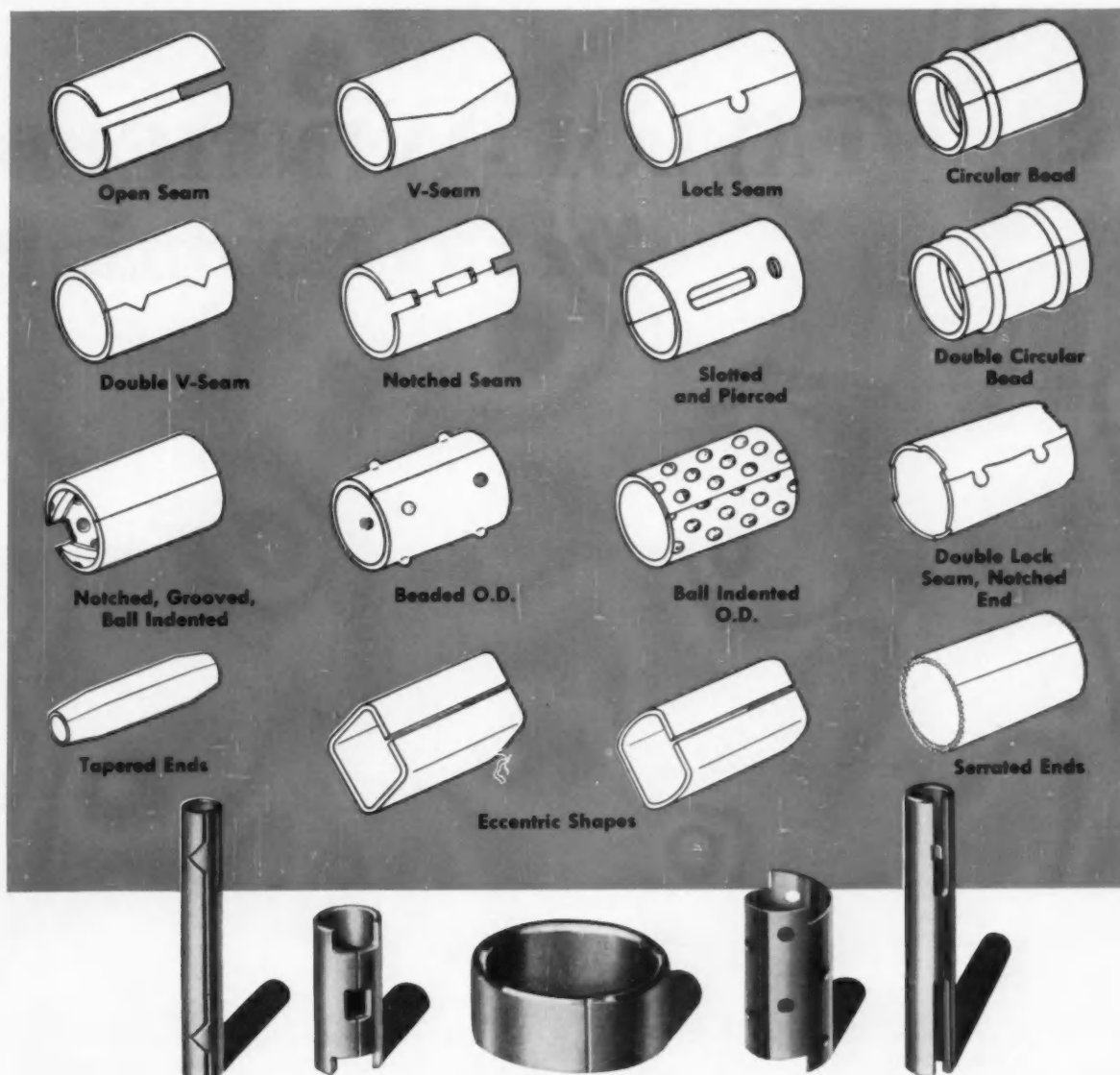
David Brown exhibited the Aston Martin Mark III coupe, derived from the DB2-4. Output of the six-cylinder 178-cu in. engine is increased to 162 hp at 5500 rpm (178 hp with twin exhausts), largely by means of a new cylinder head with twin overhead high-lift camshafts, larger valves, and altered breathing. Disk brakes are used in front, and the swivel pins are located within the hubs to provide center-point steering. Suspension is by trailing links and coil springs.

Another improved model in the connoisseur class was the two-door Bristol 406 with coachwork designed by the Swiss firm of Beutler. Displacement of the six-cylinder engine is increased to 135 cu in., giving the same maximum output of 105 hp but at the lower speed of 4700 rpm and with better torque characteristics. All wheels have disk brakes. Swiss styling was seen also on the Alvis Graber convertible.

The British body-builders Freestone & Webb presented a two-passenger Rolls-Royce convertible on a Silver Cloud chassis featuring a power-operated top that contracts to a concealed position beneath deck panels. A single electric motor and pump operate the three hydraulic rams.

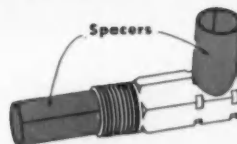
New among the miniature cars was the Frisky, made by Henry Meadows, a member company of the Associated British Engineering group. Shown in production form, it differs considerably from the prototype displayed at the Geneva Show in March. The simple tubular chassis frame has up-swept rear members supporting the coil springs that suspend the solid rear axle located by trailing radius arms. A 16-hp aircooled engine chain-drives the narrow-track axle without a differential. Front suspension is by leading links swinging in bonded rubber collars, the entire units pivoting on king pins for steering.

The plastic body is reinforced with steel at the mounting points. Access to the single bench seat is (Turn to page 140, please)



Rolled Split Steel Spacer Tubes in Great Variety and at Low Cost

Used in hundreds of automotive, appliance, farm implement and wheeled goods assemblies, they save time, labor and costly materials. An economical substitute for iron pipe, tubing or machined parts, they are delivered ready for assembly, to exact dimensions. A special catalog with design data is available, without obligation. Address:



Spacers can be furnished with brazed seams and we can braze spacers to other components, as shown here.

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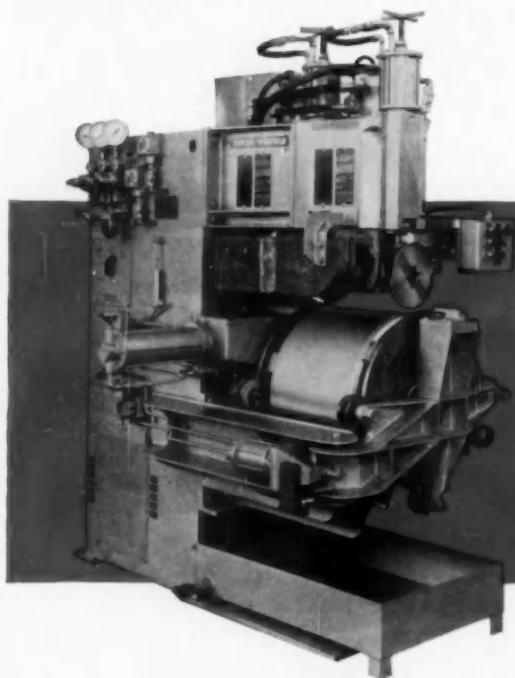
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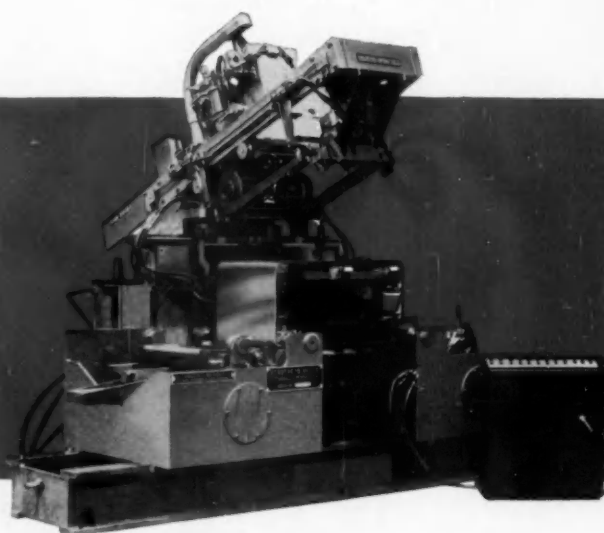


TAYLOR-WINFIELD

Metal Forming

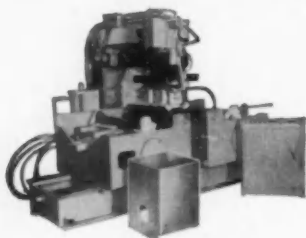


Taylor-Winfield, leading electric welder manufacturer . . .

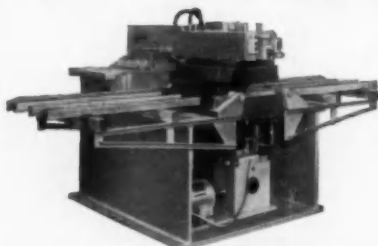


. . . experienced in design and fabrication of combination bender-welder equipment . . .

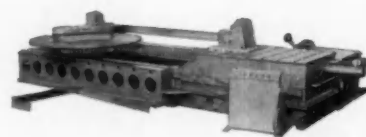
Taylor-Winfield Offers New



**TANGENT
BENDERS**



**FOLDING
MACHINES**



**ROLLER TABLE
BENDING MACHINES**

for the Automation Lines

acquires . . . Machinery lines of

**Struthers
Wells**

The Taylor-Winfield Corporation, leading electric welder manufacturer, has purchased the exclusive lines of metal-forming and work-handling machinery formerly built by the Struthers-Wells Corporation.

Taylor-Winfield tangent benders, roller table and tumble die benders, punching and notching machines, folding machines, brake presses, de-stackers, pipe benders and related dies are now offered to automotive, home appliance and other sheet metal product manufacturers. One fully responsible builder now can supply a coordinated production line—handling coil or sheet to the final formed and welded product.

Struthers-Wells Corporation has discontinued the design, manufacture and sale of this machinery. Taylor-Winfield will provide replacement, repair and redesign service for metal-forming and work-handling machinery manufactured previously by Struthers-Wells. A team of Struthers-Wells machinery specialists, including management and other key personnel, have joined Taylor-Winfield.

Contact one of the offices below for prompt, specialized attention to your welding and metal-working production problems.

. . . acquires leading line of metal forming and work-handling equipment from Struthers-Wells Corp.



TAYLOR-WINFIELD Corporation

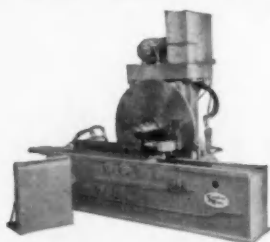
WARREN, OHIO

**ELECTRIC RESISTANCE AND ARC WELDING MACHINES
METAL FORMING AND WORK-HANDLING EQUIPMENT**

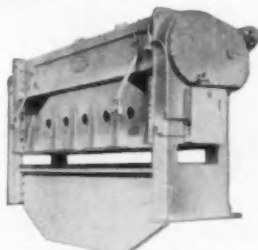
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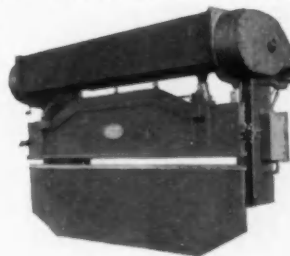
Products



**TUMBLE DIE
BENDING MACHINES**



**PUNCHING AND
NOTCHING MACHINES**



**BRAKE
PRESSES**

of Modern Industry

London Show

(Continued from page 136)

through conventional doors instead of the gull-wings of the prototype. Both hardtop and convertible models are available, and styling was executed by Giovanni Michelotti. Weighing only 752 lb, the Frisky has a 5-ft wheelbase, is 9 ft 1½ in. long, and 4 ft 7½ in. wide.

Spurred on by the acceptance

in America of its midget plastic-bodied sports car, Berkeley has introduced a higher-powered model using a three-cylinder, two-stroke engine of 30 cu in. displacement. This aircooled unit develops 30 hp at 5500 rpm, and drives the front wheels through a four-speed gearbox. Suspension is all-independent. The new Berkeley will sell in the eastern states for \$1800.

A magnetic coupling is offered as an alternative to the conventional friction clutch on the

B.M.W.-Isetta 600 four-seat bubble car that was exhibited at Earls Court. Produced in Britain by S. Smith and Sons, the clutch is based on the Eaton unit, for which that company holds exclusive patent rights outside North America (see A.I. for Dec. 15, 1956).

MOTOR VEHICLE REGISTRATION

(Continued from page 104)

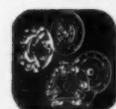
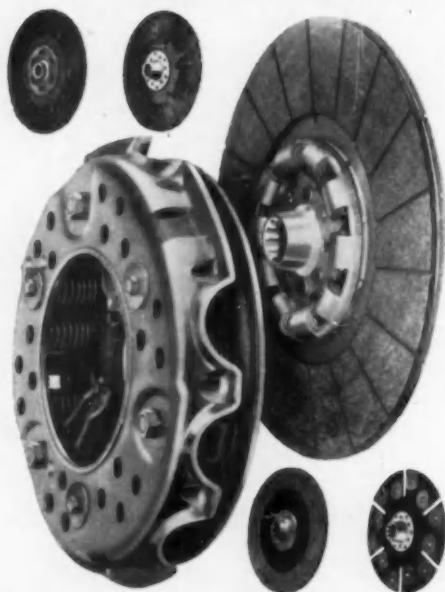
Pennsylvania, fourth with 4,031,000, followed by Ohio, Illinois and Michigan, in the order named, with well over three million vehicle registrations in each state. The remaining three states out of the first ten leading states are New Jersey, Indiana and Florida, listed in consecutive order. Registrations of these ten leading states represent 54 per cent of U. S. registrations.

Four states will now have over four million registrations, seven states over three million and twenty-six states will have over one million vehicle registrations. Since the end of World War II, motor vehicle registrations have just about doubled in number. Present indications are that the District of Columbia will show a decrease in 1957 from 1956, but, it is quite possible that, when final data are compiled, this decrease will be eliminated. New York appears to have practically the same number of vehicles as they had last year and all other states show increases.

These data are the result of a survey conducted by AUTOMOTIVE INDUSTRIES. Forty-four motor vehicle commissioners cooperated in furnishing estimates of their state vehicle registrations as of the end of their registration year. From past experience in these annual surveys, it is believed that the estimated U. S. totals will closely approximate the final count which will appear in the 1958 Statistical Issue of AUTOMOTIVE INDUSTRIES.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

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Small Spring Loaded



Heavy Duty Spring Loaded



Oil or Dry Multiple Disc



Heavy Duty Over Center



Power Take-Offs



Speed Reducers

A Clutch Plate—for Every Use

ROCKFORD CLUTCHES are made with a wide variety of friction plates—to meet your specific needs exactly. Organic, metallic, segment or Morlife® cerametallic facings provide the right torque, wear and heat resistance characteristics. Cushioning arrangements minimize the effects of shock-load engagements. Dampeners blot out vibration and chatter. Pressure plates of high tensile strength resist centrifugal force of modern high speed engines. These ROCKFORD advantages will help you select the right friction clutch for your particular needs.



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Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER

315 Catherine St., Rockford, Ill., U.S.A.

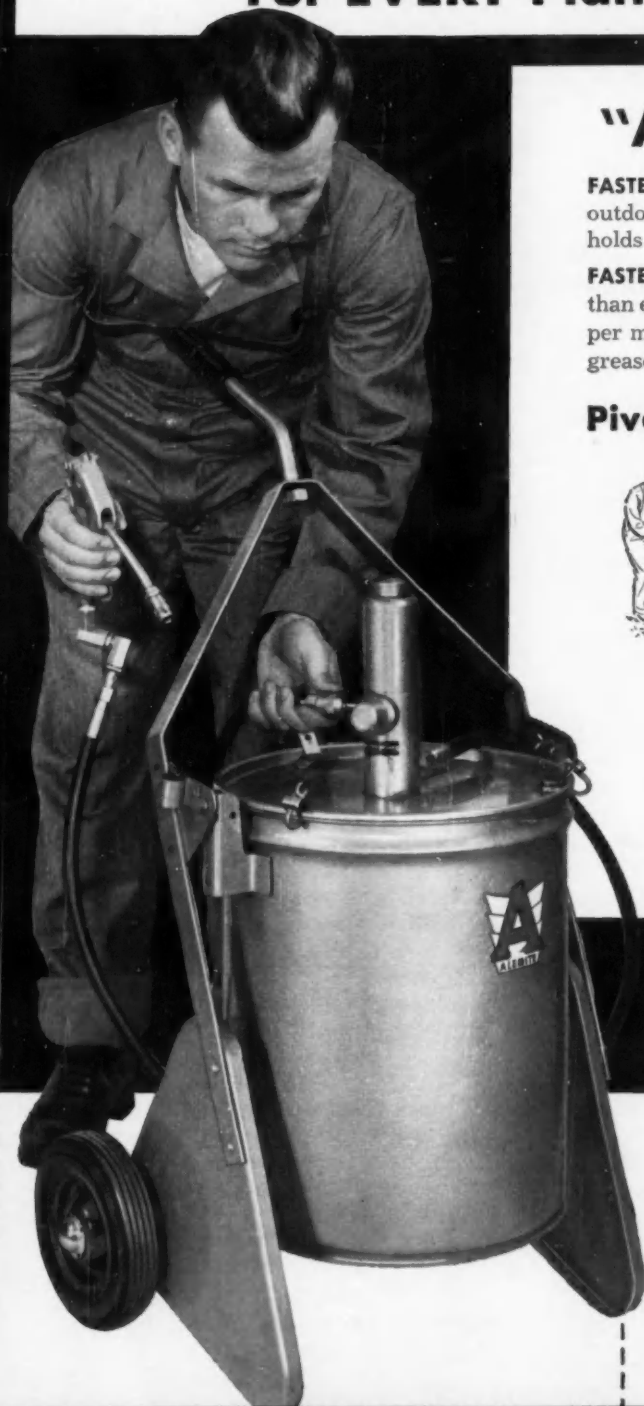
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FASTER—because it's easier to handle! Saves lubrication time outdoors or indoors—anywhere in the plant. Pivot-swing dolly holds container upright at any pulling angle.

FASTER—because exclusive, newly designed pump packs more than enough power for every job. Delivers 14½ oz. of gun grease per minute at 70°F. Holds 25-, 35-, or 50-lb. pail—or 70 lbs. of grease. Dynamic primer assures positive priming.

Pivot-Swing Dolly For Easy Moving...



Over rough ground!



Up and down steps!



Over rough floors!

Electric-Powered "Porta-Kart"

Only 18" wide. Easily moves through narrow aisles. Capacity, 12 pounds. Delivers 13 oz. of pressure gun grease per minute. Automatic switch shuts off motor when 5,000 lbs. of pressure is built up. Model 7182-B.

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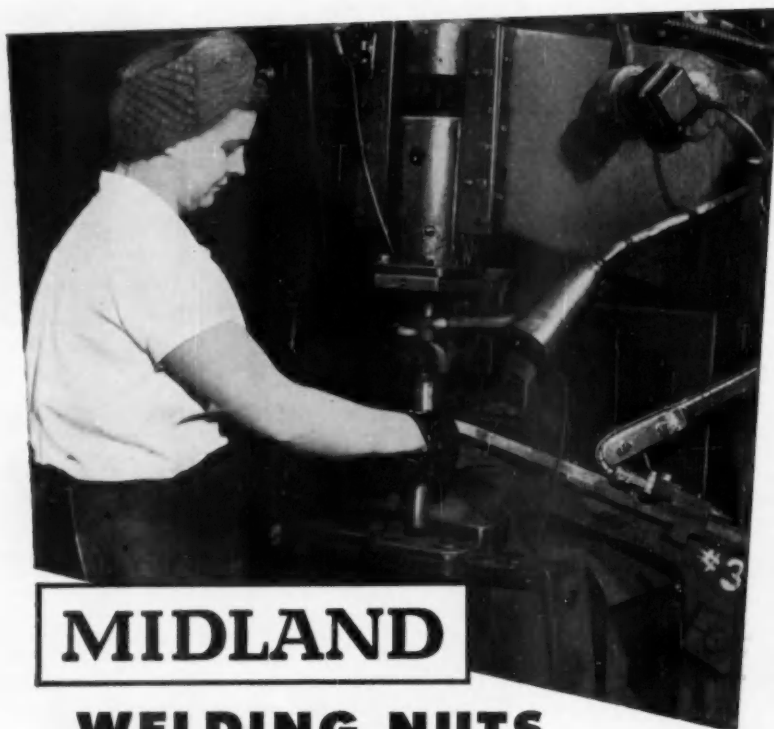
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WELDING NUTS

Cut Assembly Time . . . Insure Proper Fit of Metal Parts

Modern designers of metal parts are finding Midland Welding Nuts a simple, low-cost means of insuring strong, bolted unions at hard-to-get-at places. Once the nut is welded into position at the exact location, the bolt can be easily turned into it without requiring a holding device on the nut. This not only means a saving in assembly time, but often results in one man being able to do a job previously requiring two.

If you're a manufacturer of metal parts, you can enhance your product appeal and at the same time pass along substantial savings to your customers if you use Midland Welding Nuts. By equipping your product with these lock-sure nuts, assembly flows uninterruptedly and parts fit accurately. Welding nuts are applied in a matter of minutes, last the long life of your product.

Inquire about this economical convenience today. You'll find it pays for itself over and over again.

The MIDLAND STEEL PRODUCTS COMPANY

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Export Department: 38 Pearl St., New York, N. Y.

AUTOMOBILE and TRUCK FRAMES

• AIR and VACUUM POWER BRAKES

AIR and ELECTRO-PNEUMATIC DOOR CONTROLS

AIRBRIEFS

(Continued from page 102)

tunnel where high temperature gases at supersonic speeds are produced to test models of various kinds. An electric arc tunnel is used to test re-entry missile shapes at temperatures up to 20,000 F. A magnetic field type of propulsion system using ions (tiny bits of matter carrying electrical charges) is being considered for application to flight in space.

High Energy Aircraft Fuels—

Search for new fuels has continued at a rapid pace. Most promising of the new fuels is the high energy boron-hydrogen compounds, the boron hydrides or boranes. Theoretical studies made by NACA indicate a boron fuel could extend the range of jet aircraft by 40 per cent over that calculated for the present day JP-4 jet fuel. Before using boron fuels research efforts must yet overcome the toxic problem and the products of combustion which produce deposits of material within the jet engine.

Aircraft Nuclear Propulsion—

Studies are progressing to evaluate methods of using atomic energy to propel aircraft, missiles and rockets. Reactor problems to achieve symmetrical heat distribution and to adapt reactor air cooling coupled to a turbojet engine drive are among several fields being investigated, including radiation shielding and other important factors.

High Energy Rocket Propel-

lants—Recently completed at the Lewis Laboratory is a new rocket-engine research facility. Its thrust stand is capable of testing a 20,000 lb vertically fired rocket. Among rocket fuels being considered are such combinations as fluorine-ammonia, fluorine-hydrazine, oxygen-hydrogen, fluorine-hydrogen and ozone-hydrogen. In a demonstration of the oxidizing power of fluorine a jet of the gas was directed on a sheet of asbes-

(Turn to page 162, please)

*Assured
With This*

OVER-SPRAY and FUME CONTROL CROSS DRAFT, FLOOD SHEET TUNNEL TYPE SPRAY BOOTH

by
PETERS - DALTON







TUNNEL TYPE SPRAY BOOTH —
BUILT AND INSTALLED BY
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ICE AT THE NEW LINCOLN DIVI-
SION PLANT, WIXOM, MICH.

Loss of time and impairment of working conditions is eliminated in finishing operations with an installation by P-D such as illustrated above. While the tunnel type booth shown was designed, engineered, built and installed by Peters-Dalton for a major automotive manufacturer, a comparable or smaller cross draft, floor-sheet booth may be the answer to your finishing problem. The size of your product or production run quantities may not require as large an installation. However, regardless of your needs, Peters-Dalton can design a finishing system to best and most efficiently meet your production finishing requirements.

Peters-Dalton offers more than a quarter century of designing, engineering and building finishing systems of all sizes and types. Low initial cost and economical production runs can be yours with an installation by P-D. Why not send us your specifications or prints? Just write, wire or phone . . . we'll be glad to tell you more.

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**This 48-page illustrated booklet
tells how to cut cleaning costs
in aircraft production.**



1	How to clean aluminum before anodizing. See pages 4 to 8.
2	How to prepare aluminum for welding. See pages 10 to 14.
3	How to prepare aluminum for painting. See pages 15 to 19.
4	How to clean aluminum before and after heat treating. See page 20.
5	How to strip paint from aluminum. See pages 22 to 26.
6	How to clean magnesium. See pages 27 to 29.
7	How to install cleaning tanks and spray-washing machines. See pages 31 to 35.
8	How to control overspray in paint booths. See pages 36 to 37.
9	How to clean engine test cells. See page 40.

FREE Write for your copy of the booklet.

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Send me a **FREE** copy of "How to clean metals in aircraft production"
I am especially interested in the jobs indicated by the numbers I have
circled below:

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COMPANY _____

ADDRESS _____

Teamwork Among Stylists and Body Engineers A MUST

(Continued from page 50)

open position independently of the other, and in any sequence.

3. The latching of either door must be independent of the other; each door must latch or be opened from its own handles inside or out without affecting the other.

Since there is a possibility of a front opening door hinged at the rear being pulled open by the wind, the following requirements were necessary.

4. The inside rear door handles must not operate if the transmission is in gear.

5. If either of the rear doors is open, the transmission selector must be blocked from shifting into any drive position.

As a convenience feature, coincidental locking was to be included:

6. Provisions are to be made to allow all door locks to be locked electrically from either front door locking control.

The final solution required the use of linkage-type hinges having a reciprocating hinge center. A variation of the standard "four bar mechanism" was used to provide the required motion. The short rotating control links are pivoted with the connecting link being extended to form the hinge strap which attaches to the door. The connecting link always rotates about an instant center located at the intersection of the centerlines of the two control links. As the links move, the center of rotation of the hinge strap moves also. The location and lengths of the links were so chosen that with the door in the closed position, the hinge center is well inboard and to the rear of the door opening. When the door is full open, the hinge center has traveled forward and outboard until it is actually outside the outer surface of the body pillar.

Because of the rapid translation of the hinge center during the movement of the door, it was necessary, to prevent hinge bind, to integrate the upper and lower hinges and the door into a coordinated unit. The rear control links of the upper and lower hinges were connected by a rigid torque bar. The hinge straps were rigidly attached to the door in the normal manner and connected to the rear control link system at one point at top and at bottom. The for-

(Turn to page 148, please)



Unique duals raise up to lighten the pull... Bridgeport Aluminum Lightens The Load

This new trailer by DeRosa and Sons, Belleville, N. J., has a novel air-suspension unit which permits either front or rear axles to raise off the road when the trailer is not loaded. The design saves tire wear—permits flats to be changed without using a jack—reduces the pull when the trailer is empty.

And there's another smart idea in this trailer. Gleaming, durable Bridgeport Aluminum Extrusions form the frame of the body, which means the trailer is light, rugged, requires less maintenance, and will never rust.

Why do truck and trailer builders look to Bridgeport for extrusions? Lots of reasons!

Availability, for instance. There is a wide range of standard Bridgeport truck and trailer shapes immediately available—all without die charge. Custom-designed shapes can be

furnished to meet special and exacting requirements.

And *quality*. Close tolerances that make assembly easier and simpler. And surface finishes that have that extra quality appearance.

And *service*. The kind of service and attention to detail you'd expect from a "small" manufacturer—and get from one of the nation's leaders!

Write for Bridgeport's 130-page Aluminum Extrusions Book, on your letterhead. It has complete information on trailer assembly alloys, fabricating, etc., plus full-scale drawings of standard Bridgeport truck and trailer shapes.



For the very newest in
BRIDGEPORT ALUMINUM

Aluminum Extrusion and Forging Facilities at Adrian, Michigan
Bridgeport Brass Company, Aluminum Division, Bridgeport 2, Conn. • Sales Offices in Principal Cities

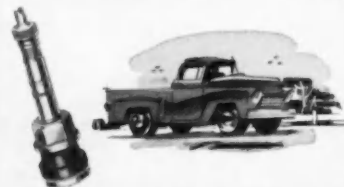
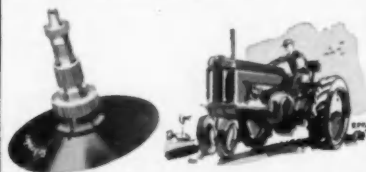
1900's

— Schrader Cycle-type Valves
on earliest airplanes



OUTSTANDING TIRE

Quality Schrader Tire Valves keep rolling up the miles with every type of vehicle



TODAY

— Schrader Valves on modern
high speed airplanes



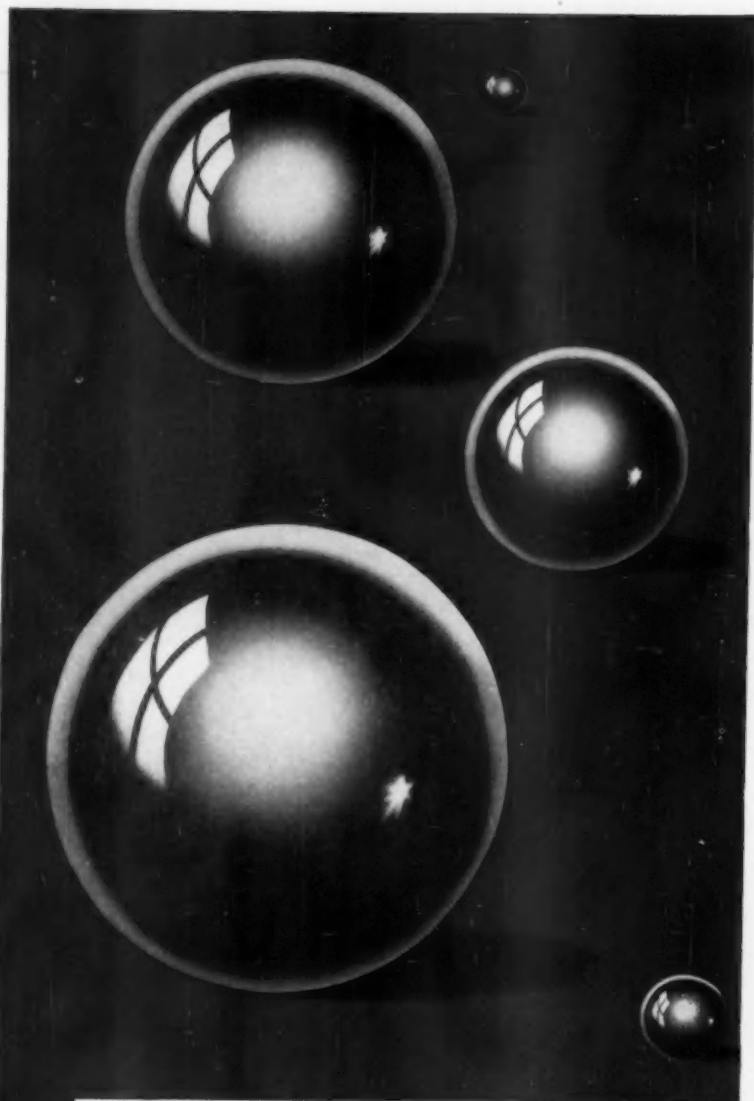
VALVE PERFORMANCE: Whose responsibility?

Tire valve responsibility is not just one company's — it's the concern of all the Industry. High tire valve standards are the result of the combined skills and experience of Automotive, Tire and Valve Engineering. Schrader's part is to combine all the Industry information and experience, and produce the safest, most practical valves that different types of pneumatic tires need — now and in the future. That's Schrader's role. You can count on Schrader Valves for the best performance on any or all of your vehicles.

Schrader
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A. SCHRADER'S SON • BROOKLYN 38, N. Y.
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FIRST NAME IN TIRE VALVES
FOR ORIGINAL EQUIPMENT AND REPLACEMENT



COOLIDGE *Balls*

CHROME ALLOY AND STAINLESS

COOLIDGE CORPORATION
MIDDLETOWN, OHIO

Teamwork Among Stylists and Body Engineers A MUST

(Continued from page 144)

ward control link was required only at one place in the system, and was located in the lower hinge.

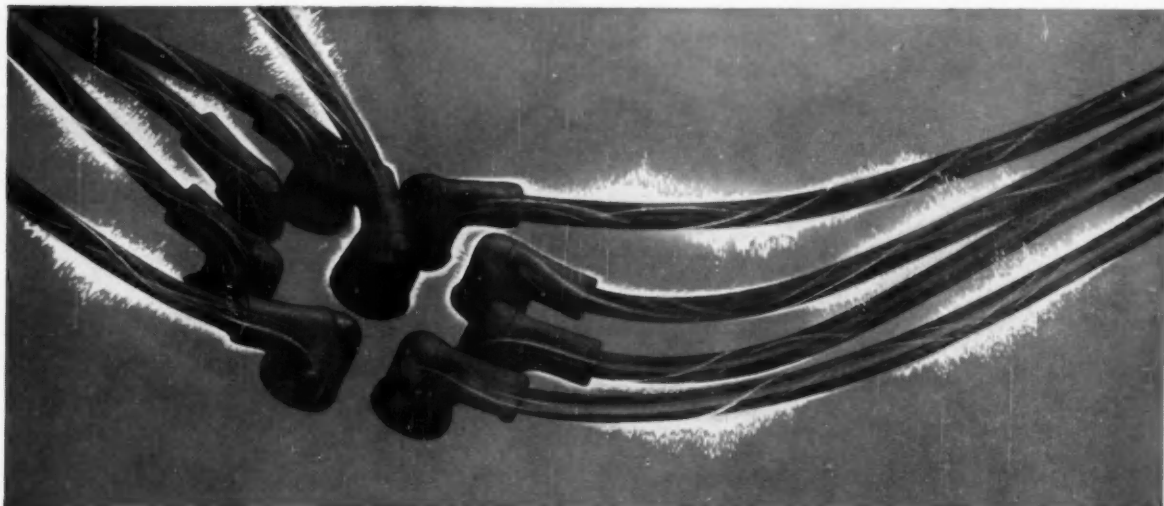
Counterbalance for the weight of the door was provided by a torque rod bent into a "U" and fastened at one end to the upper hinge box and at the other end to the upper hinge strap. Door hold-open is accomplished by a spring loaded cam lever acting against a pin in the upper hinge strap. With this coordinated, semi-integral design, the reciprocating hinge assembly compares favorably in rigidity, strength, and performance with the conventional single pivot hinges used on the front door and on other body styles.

The Significance of Motor Truck Styling

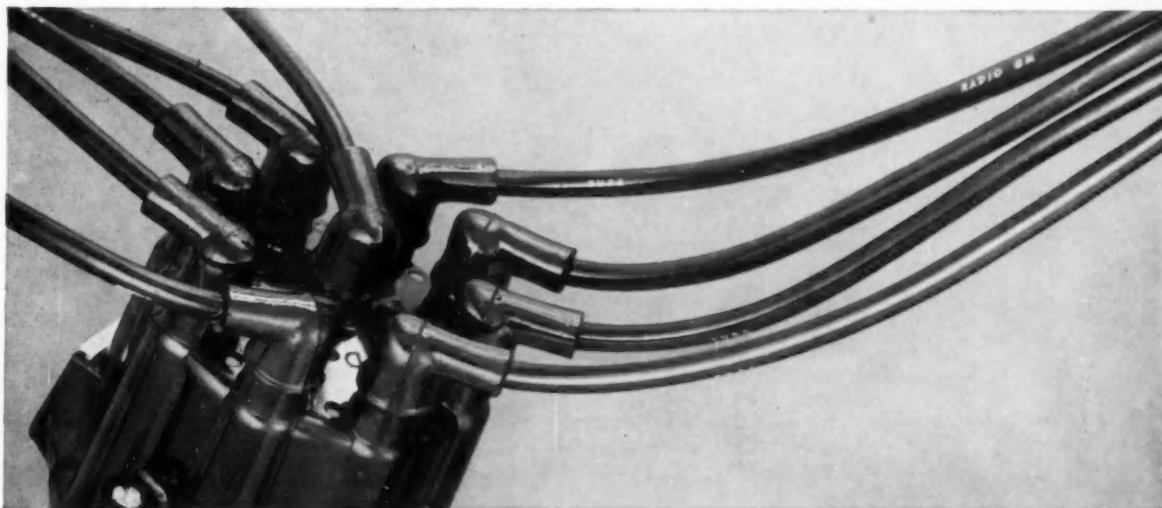
By Theodore Ornas
Motor Truck Div.
INTERNATIONAL HARVESTER CO.

RECENT styling developments in light-duty trucks further substantiate the fact that motor trucks must be designed and styled in taste with the application of the vehicle. Evidence of this appears in the light-duty trucks as we see the influence of passenger car design bringing forth heretofore unknown features in motor trucks, such as a choice of interior and exterior color combinations, nylon fabrics, padded door panels and a host of other decorative features. A final break with past traditions can be seen with the introduction of the flush sided pickup body which gives a more unified appearance to the vehicle. It follows naturally that this class of truck should, to some degree, resemble the styling of the passenger car since it operates in the same environment and design is not restricted to a great degree by mechanical factors.

Although recent years have seen
(Turn to page 159, please)



DON'T / *"broadcast" trouble through ordinary ignition cable!*



DO / *suppress Radio-TV interference with Packard T.V.R.S. cable!*

Packard Electric's exclusive T.V.R.S. cable carries the electricity that makes the ignition spark, while it simultaneously stops interference.

Thus, using *only* Packard T.V.R.S. cable, you successfully stop "broadcasting" ignition interference, which can drastically affect operation of car radios and neighboring TV sets. By distributing resistance over the entire wiring circuit, T.V.R.S. cable does a more effective suppression job than can be done any other way.

T.V.R.S. cable makes spark plugs last longer, too. The non-metallic conductor reduces electrical oscillations which cause spark plug electrode erosion.

A Packard Electric terminal-attaching process makes T.V.R.S. cable easy to use on any ignition system. And packaged replacement kits are available for all your service needs. Get the facts now. T.V.R.S. cables can eliminate a troublesome problem for you—and save you

money besides! Packard Electric maintains offices in Detroit, Chicago and Oakland, California for your convenience.

Packard Electric
Warren, Ohio

"Live Wire" division of General Motors



Flag-raising day at
another great new
Olin Aluminum plant

Cradled in the heart of the Ohio River Valley, this expansive industrial giant is about to spring to life.

Ultra-modern from the ground up, this huge new Olin Aluminum Sheet Mill within a few short months will add its production to the vigorous mainstream of quality Aluminum flowing to the nation from four Olin Aluminum plants.

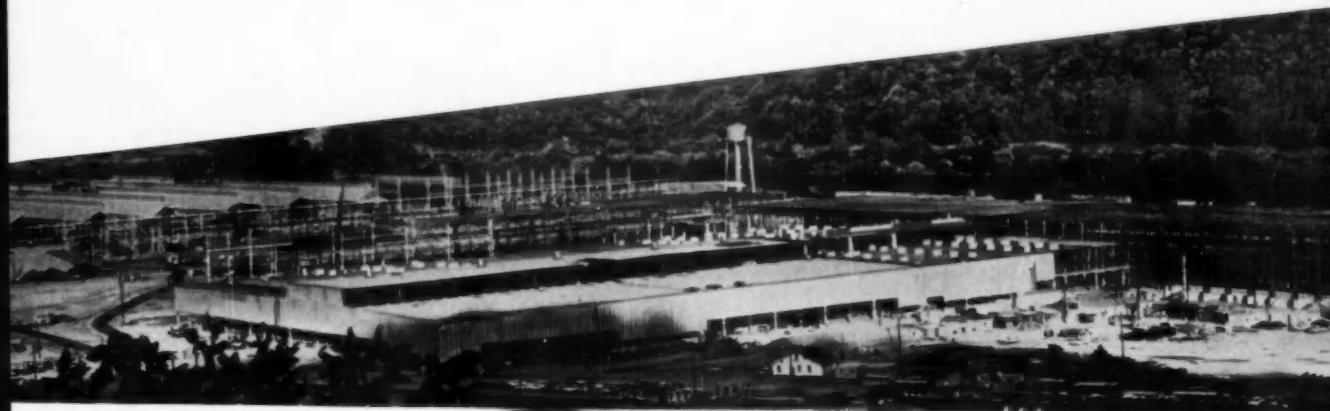
Flag-raising day at this giant new mill will mark an important new chapter in the exciting 22-month growth of Olin Aluminum. New ore ships, rolling mills, extrusion plants and wire and cable mills are already in operation or under construction. With these modern, fully-integrated facilities, Olin Aluminum is right now on the way to an initial annual volume of 340 million pounds of quality Aluminum. And that is only the beginning.

This new Aluminum will be custom-tailored to your specifications. And the unique standards of quality and service by which it will be produced and delivered to you will help you simplify your manufacturing procedures and achieve maximum efficient production from each pound you use.

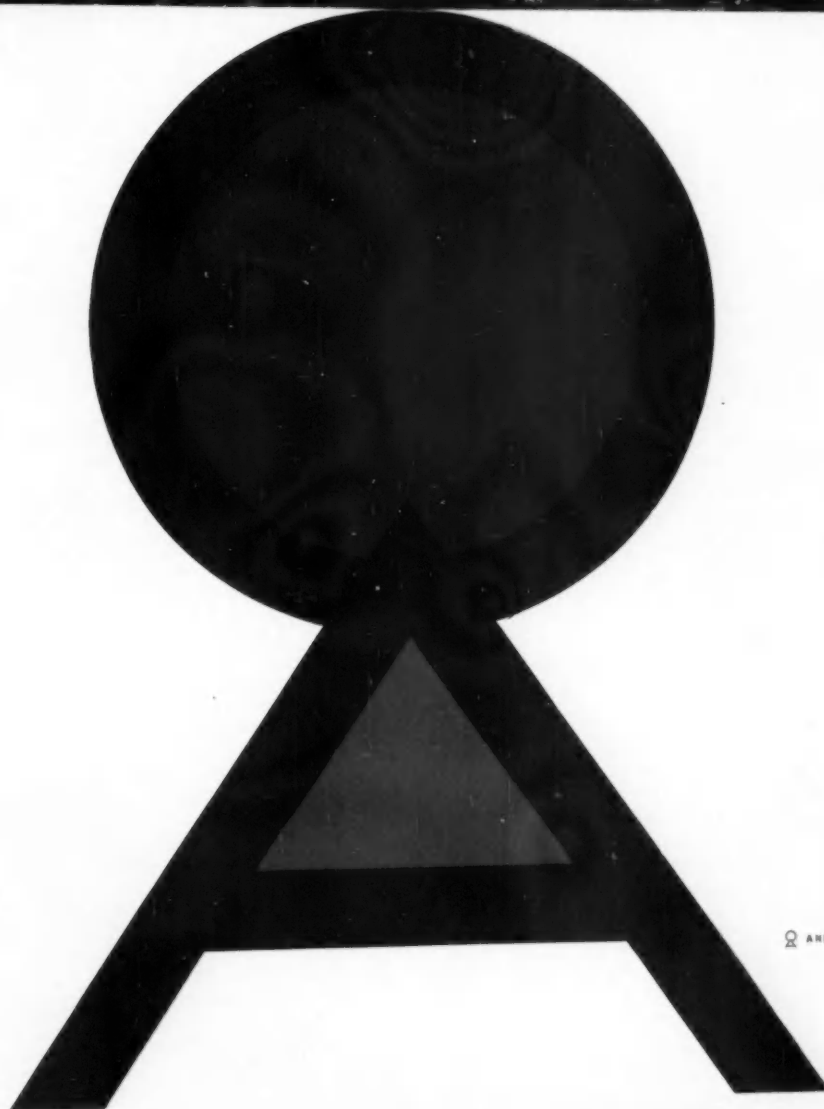
If this is the kind of quality and service you have long been looking for, write now for product availabilities to our new permanent sales headquarters: Aluminum Division—Sales, Olin Mathieson Chemical Corporation, 400 Park Avenue, New York 22, New York.

OLIN
ALUMINUM

Symbol of new Standards of Quality and Service in the Aluminum Industry



Givens



 AND "OLIN ALUMINUM" ARE TRADEMARKS

Want to SAVE up to 70% of heating costs on your phosphate coating line?

new Parker *Cold Bonderite System does it!*

Turn down the heat! Put most of your Bonderite line heat costs back in the till! Parker Rust Proof Company has developed a new Bonderite system for low temperature operation.

It includes a new cold alkaline cleaner that works beautifully at 70° and is effective in a temperature range from 60° to 120°. A new Spra-Bonderite, specially formulated to produce a superior coating at low temperatures, has been developed to work in conjunction with the new Parker cold cleaner.

With the new cold Bonderite system, savings are really sizable. Heat consumption in the line is cut by as much as 70%. Cost of the new Parker system is approximately equal to conventional alkali cleaners and

phosphate coating chemicals, so the savings in heat are practically all velvet. It is estimated that on an average automobile body line the savings in steam costs can run as high as 10 to 12 cents per body; on an average refrigerator line 4 to 5 cents per cabinet. Savings in B.T.U.s can mean savings in dollars.

The new cold Bonderite system has been production-tested in mass production plants. Its performance has amazed the experts. It's ready to go to work in your plant, saving you money, right now!

Why go on paying for heat you don't need? Start using Parker's new cold Bonderite system. A letter or phone call will bring a Parker man with full, money-saving details.

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER RUST PROOF COMPANY
2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE
corrosion resistant
paint base

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aids in cold forming
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PARCO COMPOUND
rust resistant

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surfaces

TROPICAL
heavy duty maintenance
paints since 1883





DANA

It takes the right system

It takes the right system to make the score . . .



Their famous systems helped make the win! In hockey: Olson to Gordon to Glover and goal! In baseball: Tinker to Evers to Chance and out! In football: Knute Rockne's famous Box Shift scored touchdowns!

Their secret was keeping their power flexible . . . passing it from point to point with flashing speed to meet ever-shifting problems.

That is the secret of the Spicer POWR-LOK Differential. POWR-LOK automatically delivers the greatest driving force to the rear wheel that has the best gripping traction. It instantly shifts this driving power from one wheel to another, as the tractive conditions under each wheel change, to assure pulling power like this:



POWR-LOK ends slipping on ice or wet hills and pavements if either rear wheel can catch hold.

POWR-LOK ends sliding, grinding and getting stuck in mud or sand if either rear wheel can catch hold.



POWR-LOK stops "wild wheel" hop and spin on rough, bumpy roads, ending dangerous car swerve and unbalance.

Write for booklet illustrating and describing the many advantages of the Spicer POWR-LOK Differential.

DANA CORPORATION
Toledo 1, Ohio

DANA PRODUCTS Serve Many Fields:

AUTOMOTIVE: Transmissions, Universal Joints, Propeller Shafts, Axles, Powr-Lok Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

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MARINE: Universal Joints, Propeller Shafts, Gear Boxes, Forgings, Stampings.

Many of these products manufactured in Canada by Hayes Steel Products Limited, Merriton, Ontario

DANA

Spicer

The launching of the world's third nuclear submarine, the Skate, at General Dynamics Corporation's Electric Boat shipyard. The Skate is the first of four nuclear submarines of its type.



from the SKATE . . .

EXPERIENCE FOR TOMORROW'S AUTOMOTIVE FILTERS

What are the filtration requirements of an atomic submarine? Like any filtration problem, they are a combination of factors, such as: the nature of the fluid to be filtered, operating pressures, temperature, corrosion . . . all of which dictate the filter media and form of the filter. The filters must be engineered to meet the specific requirements of the job. That's why the Electric Boat division of General Dynamics Corporation chose Purolator.

The engineering skills and manufacturing capabilities which make it possible for Purolator to

design and build filters for an infinite variety of applications, including nuclear submarines, will produce better automotive filters. In a fast-moving industry, tomorrow's requirements must be anticipated today. Because of its role as designer and builder of filters for all phases of industry, Purolator has, *today*, the experience needed to provide the specific filters you will need for tomorrow's specific requirements.

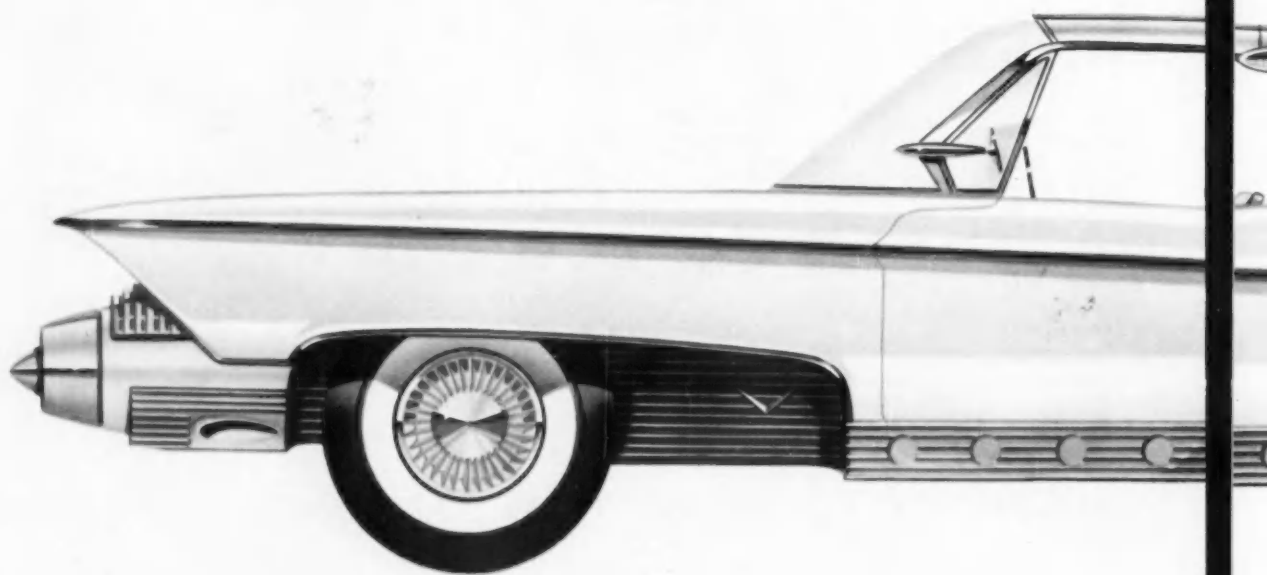
Your toughest filtration problems are within Purolator's experience.

Filtration For Every Known Fluid

PUROLATOR
PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

Exterior: The Piedmont side view presents bold, straight-through styling in aluminum! Bright, full-length rub strip is integral with the stamped aluminum body panels and one-piece cast aluminum door. Anodized finish assures permanent beauty without painting. Ribbed lower side trim is exposed portion of cast aluminum frame. Wheel wells are ridged aluminum stampings; colored vinyl fills hollows between ridges. Decorative finned casting behind front bumper is aluminum exhaust muffler. Bumpers are cast and extruded aluminum. Retractable hardtop of aluminum sheet, forgings and castings folds to half its length, disappears into rear deck. Roll-away deck cover of aluminum extrusions and neoprene joining strips leaves opening unobstructed.

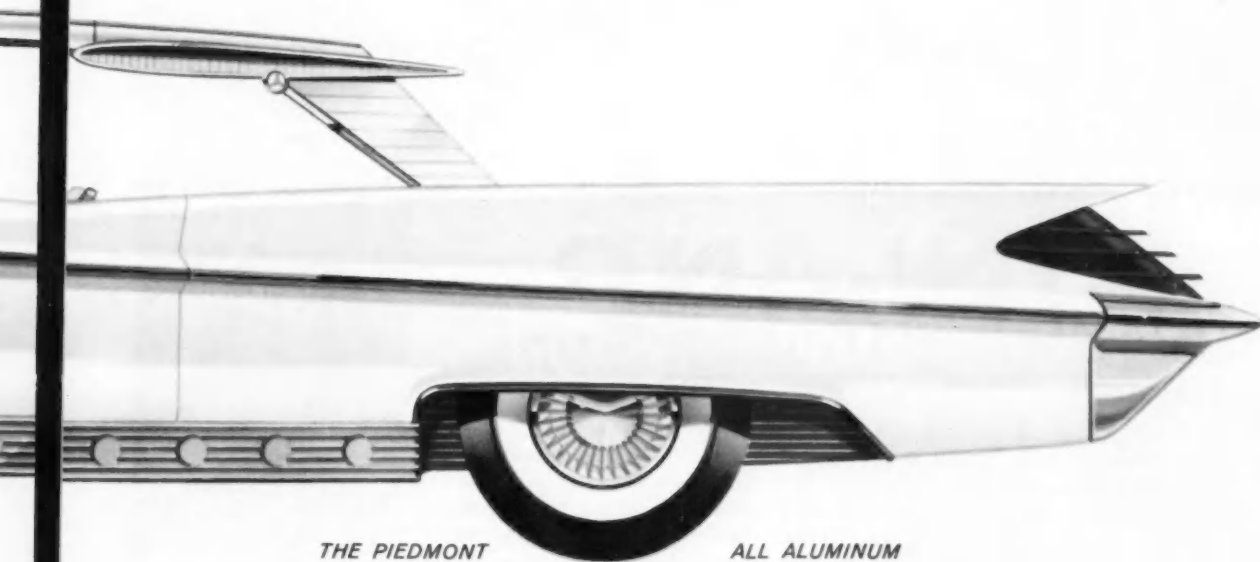
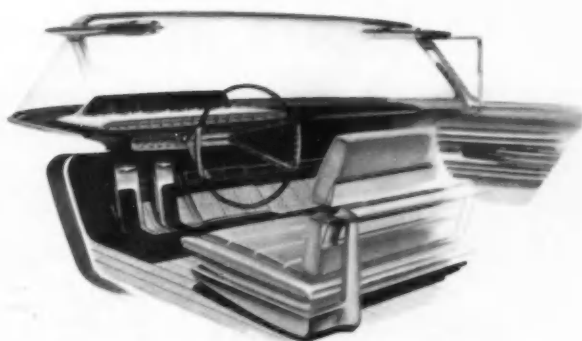


A KAISER ALUMINUM DESIGN

This Kaiser Aluminum design represents a concept of a car for the immediate future. Its purpose is to suggest aluminum's versatility . . . aluminum's infinite range of automotive design possibilities. The applications shown are logical, within the realm of present possibility.

Kaiser Aluminum will be pleased to work with you as your "idea partner" for further development of ideas suggested by this design.

Interior: The Piedmont's interior presents an inspiration for experiment from firewall to seat back! Firewall, toe-board and panel parts are integrated into a single aluminum casting. This casting also includes heater-ventilator grilles and all necessary bosses and studs (for easy assembly). Speedometer numerals are cast into instrument cluster housing. Floorboards feature cast-in texture and pattern to eliminate need for carpeting, and all corners can be full-rounded to simplify sweeping and cleaning. Inner door panel shows another example of cast-in texture and trim with permanent anodized color. Seat frame of forged aluminum permits very light construction with sculptured styling. For the pivoted backrest, the seat back may be stamped, cast or extruded of aluminum, with unlimited variations of formed-in texture available for decorative trim.



FOR IMAGINATION IN ALUMINUM

Call our Automotive Industry Division, TRinity 3-8000, Kaiser Aluminum & Chemical Sales, Inc., 2214 Fisher Building, Detroit 2, Michigan.



Designs for all-weather comfort start at the windshield



with **INLAND** Self-Sealing Weather Strip

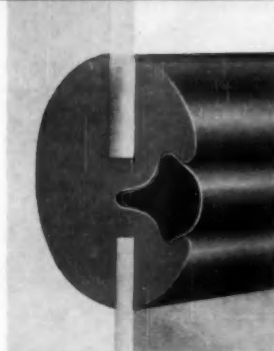
It's always fair weather behind Inland Self-Sealing Weather Strip, the only weather strip made that assures positive, permanent, all-weather comfort and still permits complete freedom of design.

Inland's Filler Strip makes the difference because both glass and body panel are under compression assuring leakproof protection. Inland Weather Strip goes into place without special moldings, channels, binder strips, and cements. Result: sav-

ings in design, construction, installation, and replacement, because what normally requires full-time services of two men can be done better and faster by one man.

Today, constant use under all weather extremes proves Inland best for manufacturer, user, and servicer.

We'll gladly show you how to anticipate—and profit by—the desire and necessity for all-weather comfort made possible by Inland Self-Sealing Weather Strip.



Here's how it works: Strip goes into body panel; glass goes into strip. Filler strip is then "zipped" into a much smaller channel creating a powerful compression on panel and glass and effecting a positive, permanent, leakproof seal.



INLAND MANUFACTURING DIVISION
General Motors Corporation, Dayton, Ohio

INLAND SELF-SEALING WEATHER STRIP IN ACTION



Transportation Industry



Railway Equipment



Marine Applications



Automotive Installations



Over-the-road Equipment



Commercial Structures

Teamwork Among Stylists and Body Engineers A MUST

(Continued from page 148)

rapid advancements in motor truck styling, we are just beginning to establish a direction leading to improved appearance of this product. The shape of the motor truck is ever changing. The truck we thought adequate a few years ago, now looks antiquated beside the latest model. We may be sure that the shape of today will look equally antiquated and quaint in the future. It is a predestined fact that the ultimate in design today will look strange and probably comically antique to future generations.

Whatever shape the motor truck may take in the future, the stylist will have to remember that the truck buyer is in business to haul a payload for a profit. It is doubtful that his purchase is motivated by a desire for social prestige or that styling for style alone is a prime factor in influencing his decision. The stylists' dreams of the future will of necessity be governed by mechanical arrangement, weight and size limitations. If these, then, be the governing factors, perhaps we can style trucks to look like trucks. We must create an individuality about trucks that shall take shape and form expressing the refinements and style within the environment in which they operate.

Zinc Alloy— Plastic Dies and the Body

Prototype

By W. J. Esdale
ALLIED PRODUCTS CORP.

ZINC alloy and plastic dies have produced successfully such stampings as, fenders, floor pan, hoods, inner door panels, frame members, or any other sheet metal stampings on an automobile body or chassis. In some instances we have produced heavy chassis parts of quarter inch material very satisfactorily.

In addition to the economic factor where many prototype bodies are

scheduled over-all program timing is important. True, it is possible to produce the first hand-made part and possibly the second and third parts in a shorter time than that to make dies and finish initial die made parts. From then on, time begins to run out for hand made parts.

Take a floor pan for an example. It is possible to produce the dies and tools to make a large front floor pan and have prototype die-made parts in approximately 7 to 8 weeks under a crash program. Regular programing

would make the die-made front floor pan available in approximately 10 to 11 weeks from the time of start. As soon as the first part was completed other parts would follow at the rate of 5 to 8 pieces a week or more.

Under a hand-made parts program it would probably take 4 to 6 weeks to produce a satisfactory hammer form with the floor pans coming off at the rate of 1 to 2 a week after that. The hand made parts would have discrepancies from welding and hand forming, etc., characteristic of

Where you want a flashing light you want TUNG-SOL Reliability

The 90 million Tung-Sol Flashers installed on American cars have established records for reliability that make Tung-Sol Flashers first choice for both initial equipment and replacement fields.



First used in 1939
... universally
used today!



ELECTROSWITCH DIVISION of TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.



A flexure test on a glass bar is being made with a Split Cabinet 60,000 lb. Electromatic U.T.M. at Corning Glass Works.

Another Tinius Olsen First

a S·P·L·I·T CABINET Electromatic UTM

Now you can enjoy all of the testing convenience and accuracy of the Olsen Electromatic, plus the advantages of split cabinet design—including no shock transfer . . . maximum floor space utilization . . . ability to locate loading and indicating units in separate areas for remote control testing of explosive or radioactive materials, etc. The only connection between the two cabinets is electrical wiring.

In addition, only the Olsen Electromatic gives you a minimum of 100:1 ratio of test ranges . . . four range capacities . . . positive testing speeds under load as well as no load . . . plus the availability of Olsen Electronic Recorders and the widest selection of strain instrumentation available. The low inertia of the Olsen weighing system coupled with fast-acting servos enable the indicating system to follow and indicate the load accurately regardless of the testing speed. Response time for both stress and strain is only 4 seconds for full scale range.



Trademark
Reg. U.S. Pat. Off.

Get the facts about Olsen Electromatic testing machines—now available in split cabinet or single cabinet design. Write today for Bulletin 54.

TINIUS OLSEN
TESTING MACHINE COMPANY
2090 EASTON ROAD • WILLOW GROVE, PA.

Testing and Balancing Machines

such items. They would not be commercially acceptable duplicates of each other.

However, the die made parts are uniform and of consistent quality similar to the eventual production part. They enable the structural engineer to get a realistic check from the road test as to the durability and practicability of the design.

Now expand the preceding floor pan problem to other body panels; hoods, fenders, roofs, quarter panels, etc., and it becomes readily apparent that under a large prototype body program that there will not be enough man hours available to produce, in volume, (15 sets or more) all the various body components in time to complete the program.

GMC Truck Line

(Continued from page 51)

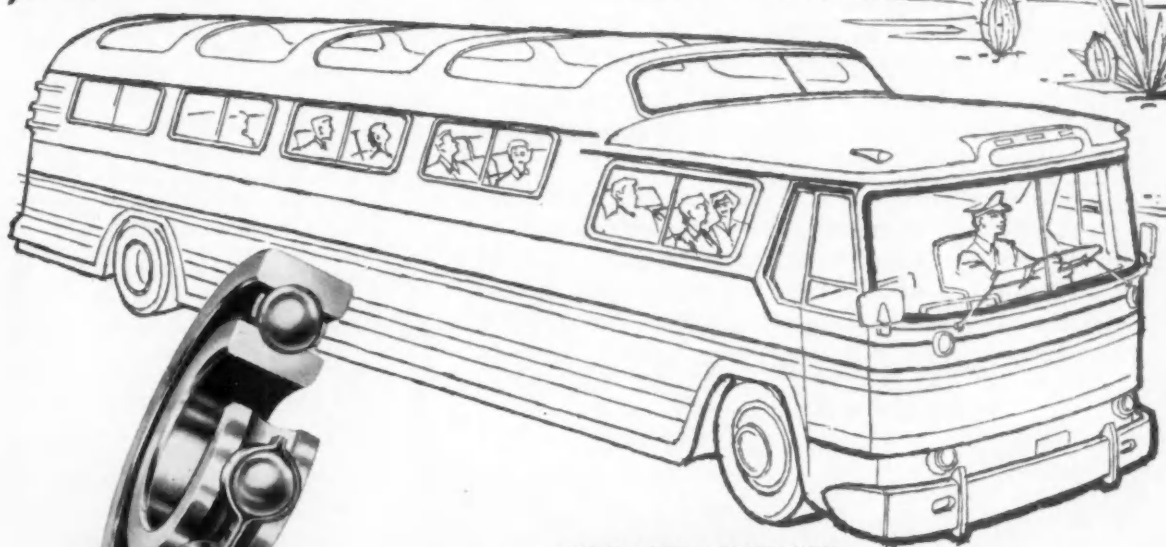
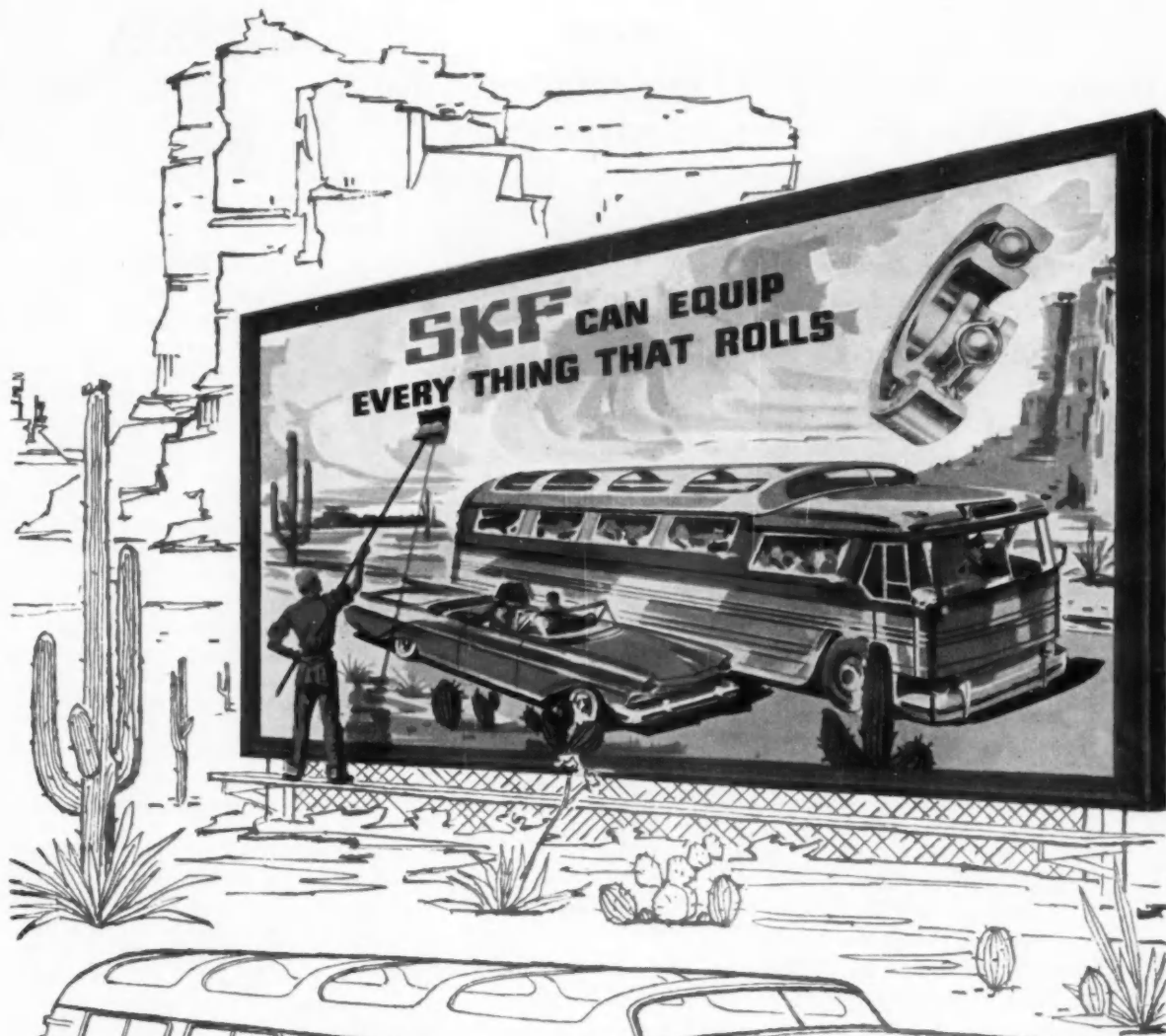
line engine is added to a group of nine gasoline and Diesel engines used through the GMC line. A valve-in-head 90 degree V-type, it develops 200 gross hp at 4400 rpm and a gross torque of 307 lb-ft at 2000 to 2400 rpm. It has a compression ratio of 7.5 to 1.

The 336 engine, available in all models up through the 500 series, has a unit-cast cylinder block and upper crankcase of nickel chromium alloy cast iron. Full-length water jackets completely surround each cylinder for proper cooling, and the 64½ lb crankshaft is of drop-forged, heat-treated steel. Tin-plated, cam-ground aluminum pistons combine light weight, fast heat conductivity and controlled expansion.

Dual headlamps are standard equipment. Low beam wattage is 100 watts; the high beam 150 watts. This compares with 80 and 100 watts, respectively, in the old system.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of
Automotive and Aviation
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EVERY TYPE—EVERY USE

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7764

Ball Bearings
 Cylindrical Roller Bearings
 Spherical Roller Bearings
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SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

To ease your needs for . . .

NEW CAPITAL EXPENDITURES

FAIRFIELD MFG. CO.
Plant in Lafayette, Indiana.



This Ultra-Modern, High Precision

GEAR MAKING

Facility

**AVAILABLE
TO YOU**

Simple arithmetic explains why, TODAY, many of America's leading manufacturers no longer undertake to solve the problems involved in making gears. For them, FAIRFIELD IS THE ANSWER!

Every facility is available at Fairfield—cost-cutting, ultra-modern equipment kept busy by volume production. This makes for economy and efficiency that can benefit YOU.

Check with Fairfield NOW on your gear production schedules. As one of the nation's largest independent producers, Fairfield can usually give you quickest service available and handle any production requirement. *Become a Fairfield customer; it pays! CALL OR WRITE.*

FAIRFIELD MANUFACTURING CO.

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Gears and Differentials

**for FINE
GEARS**

Made to Order for:

TRACTORS • HEAVY DUTY TRUCKS • AGRICULTURAL MACHINERY • POWER SHOVELS AND CRANES
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

AIRBRIEFS

(Continued from page 142)

tos causing it to burst into flames. Even a minute amount of oil on metal will cause it to burn in the presence of fluorine.

High Temperature Materials—

Greater strength of material at high temperature is a must to improve jet engines, aircraft and missiles of the future. One proved method is to disperse stable, heat resistant particles like aluminum oxide with nickel in alloy metals (precipitation hardening). NACA has been studying possible use of high melting temperature materials such as tungsten and columbium. They will retain considerable strength up to 3500 F; however, both materials oxidize very rapidly in air at high temperatures. And progress is being made in reducing the oxidation. Continued work is being accomplished to provide satisfactory refractory ceramics as a high temperature, high strength material.

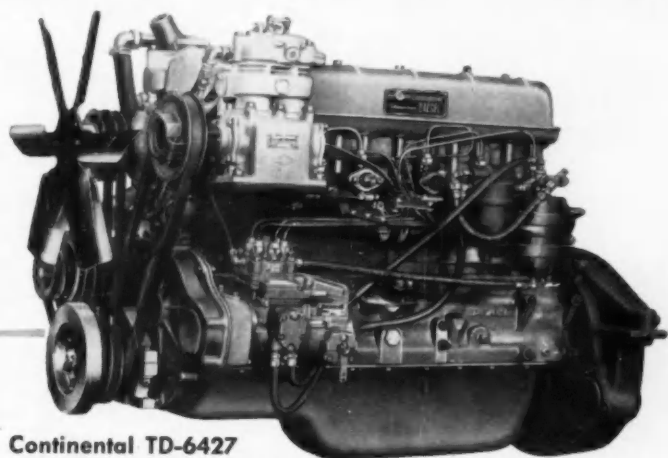
Supersonic Turbojet Propulsion

—By studying the various components of a supersonic turbojet propulsion system a proposed design has been achieved for a Mach 4 engine. Before these investigations it was believed that the turbojet engine would be limited to speeds up to Mach 2. The ingenious design requires variable air inlet and exhaust nozzle components as well as a special yet simpler turbine compressor.

Supersonic Tunnel—Our inspection ended with a tour of the new massive 10 by 10 ft (test section size) supersonic wind tunnel. Within its thick steel walls conditions of flight at 2000 mph at 90,000 ft altitude can be simulated. It requires a total of 250,000 hp of electric motors to operate the tunnel.

Such is the progress at one of NACA's research laboratories. Certainly in another three years the benefits of the current studies will be incorporated in new aircraft and missiles and it will be embarking upon new problems

Cushioned[®] Power IS THRIFTY POWER



Continental TD-6427
Cushioned Power Diesel

TRANSPORTATION DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
TD6427	6	4 1/16	4 3/8	427	116.0 @ 2400 RPM
RD6572	6	4 1/8	5 1/8	572	172.0 @ 2400 RPM
VD8603	8	4 1/4	4 1/4	603	182.0 @ 2800 RPM
SD6802	6	5 1/16	5 1/2	802	225.0 @ 2200 RPM

TRANSPORTATION GASOLINE ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N4062	4	2 1/8	3 1/2	62	26.3 @ 3500 RPM
Y4069	4	2 1/8	3 1/2	69	28.0 @ 3500 RPM
Y4091	4	2 1/8	3 1/2	91	36.0 @ 3400 RPM
F4124	4	3	4 1/8	124	47.0 @ 3200 RPM
F4140	4	3 1/16	4 1/8	140	52.0 @ 3200 RPM
F4162	4	3 1/16	4 1/8	162	58.0 @ 3200 RPM
F6186	6	3	4 1/8	186	77.0 @ 3500 RPM
F6209	6	3 1/16	4 1/8	209	90.0 @ 3500 RPM
F6226	6	3 1/16	4 1/8	226	98.8 @ 3500 RPM
F6244	6	3 1/16	4 1/8	244	105.0 @ 3750 RPM
M6271	6	3 3/8	4 1/8	271	96.5 @ 3000 RPM
M6290	6	3 3/8	4 1/8	290	108.0 @ 3000 RPM
M6330	6	4	4 1/8	330	125.0 @ 3000 RPM
M6363	6	4	4 13/16	363	146.0 @ 3000 RPM
B6371	6	4 1/8	4 1/8	371	123.5 @ 3000 RPM
B6427	6	4 1/8	4 1/8	427	142.0 @ 3000 RPM
K6271	6	3 3/8	4 1/8	271	114.5 @ 3200 RPM
K6290	6	3 3/8	4 1/8	290	123.0 @ 3200 RPM
K6330	6	4	4 1/8	330	147.0 @ 3200 RPM
K6363	6	4	4 13/16	363	162.0 @ 3200 RPM
T6371	6	4 1/8	4 1/8	371	143.8 @ 3000 RPM
T6427	6	4 1/8	4 1/8	427	170.0 @ 3000 RPM
U6501	6	4 1/2	5 1/8	501	178.0 @ 2600 RPM
R6513	6	4 1/2	5 1/8	513	192.2 @ 2800 RPM
R6572	6	4 3/8	5 1/8	572	220.0 @ 2800 RPM
R6602	6	4 3/8	5 1/8	602	232.0 @ 2800 RPM
S6749	6	5 1/8	5 1/2	749	250.0 @ 2800 RPM
S6820	6	5 1/8	5 1/2	820	275.0 @ 2800 RPM
V8603	8	4 3/8	4 1/4	603	240.0 @ 3200 RPM

A tip from fleet operators who have switched to Continental Diesel: When you're ready to "go Diesel," it pays, in more ways than just initial cost, to go the whole distance and get exclusive Red Seal Cushioned Power. In that way, you obtain fullest measure of ALL the advantages identified with engines of Diesel type. You use less fuel than with conventional Diesels. You have more cargo capacity because you're lugging less engine weight. And the wide interchangeability of parts between Cushioned Power Diesels and companion models in the Red Seal gasoline engine line expedites maintenance and sharply reduces parts cost.

AUTHORIZED SERVICE

and genuine Red Seal parts available from coast to coast.



Continental Motors Corporation

MUSKEGON, MICHIGAN

WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKEGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

needful of correct scientific solution.

Tough Surface for Instrument Dials

A new process for marking and finishing lacquered instrument dials which extends functional life under extreme environmental and operating conditions by as much as 100 per cent has been developed by United States Radium

Corp., Morristown, N. J.

The technique, first used successfully on anodized aluminum dials, essentially involves the high temperature fusing of a sprayed prime coat, sprayed background coat, image and sprayed topcoat. The resultant surface is said to be well within tolerances set out in MIL-M-13231 covering corrosion, abrasion, moisture resistance, thermal shock and resistance to solvents.

Use this high-speed assembly method to

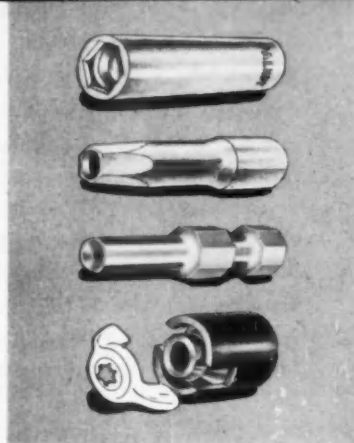
REDUCE - PARTS
- OPERATIONS
- COSTS



**Low-Cost
PALNUT LOCK NUTS**

assembled
with

**PALNUT High-Speed
MAGNETIC WRENCHES**



Your first savings with PALNUT Lock Nuts start with low price . . . and multiply through simplified, high-speed assembly with PALNUT magnetized sockets, shanks and applicators. Made for all standard power and manual tools, these PALNUT accessories permit picking up, starting and tightening in one high-speed operation. No fumbling with hand starting. Fast, uniform tightening.

In addition, a single PALNUT Lock Nut replaces one, two, three, even four fastening parts according to application and type used. Self-locking spring grip keeps parts tight under vibration. Many types and sizes offer savings for products in every field.

• Write for catalog and booklet showing PALNUT wrenches and assembly methods. Outline application for free samples.

THE PALNUT COMPANY

Subsidiary of
United-Carr Fastener Corp.
60 Glen Road, Mountainside, N. J.
Detroit office and warehouse:
730 West Eight Mile Road, Detroit 20, Mich.

PALNUT
TRADE MARK
LOCK NUTS

U. S. Helicopter Exports

Exports of helicopters for the first nine months of 1957 increased 57 per cent in value over the same period in 1956. During January through September, 1957, value of helicopter exports was \$32,246,000 compared to \$20,511,000 for the same period in 1956. The increase in number of helicopters was 30 per cent. A total of 179 was exported in 1957 vs. 138 units for first nine months of 1956. All figures are for direct factory shipments only and do not include any military aid or grant aid transactions.

This is another indicator of the ever growing use of commercial helicopters both abroad and in the U. S.

Missile Industry Association Formed

For industry teamwork to win the missile race against Russia, steps to form an Association of Missile and Rocket Industries (AMRI) were taken in a recent meeting attended by representatives of more than 30 leading companies and observers from the Army, Navy, and Air Force.

The association will include both large and small companies on an equal status. Government employees assigned to missile work may join as non-voting associates.

Engineering Teachers Earn Average of \$8862 Per Year

The average engineering teacher in American colleges and universities earns a salary of \$6,634 a year. He adds consulting and other engineering work to this, bringing his total annual earnings to \$8,862.

He earns more if he teaches in a privately endowed institution than in a public institution, and more on the Pacific Coast than anywhere else in the nation.

These figures come from a new study by the American Society for Engineering Education of 1956 engineering salary figures originally gathered by Engineers Joint Council. The ASEE's analysis is in connection with a study of how to increase the supply of competent teachers for engineering schools.

You get automatic foolproof lubrication with **LUBRIVAL** circulating oil system

FARVAL—
*Studies in
Centralized
Lubrication*
No. 207

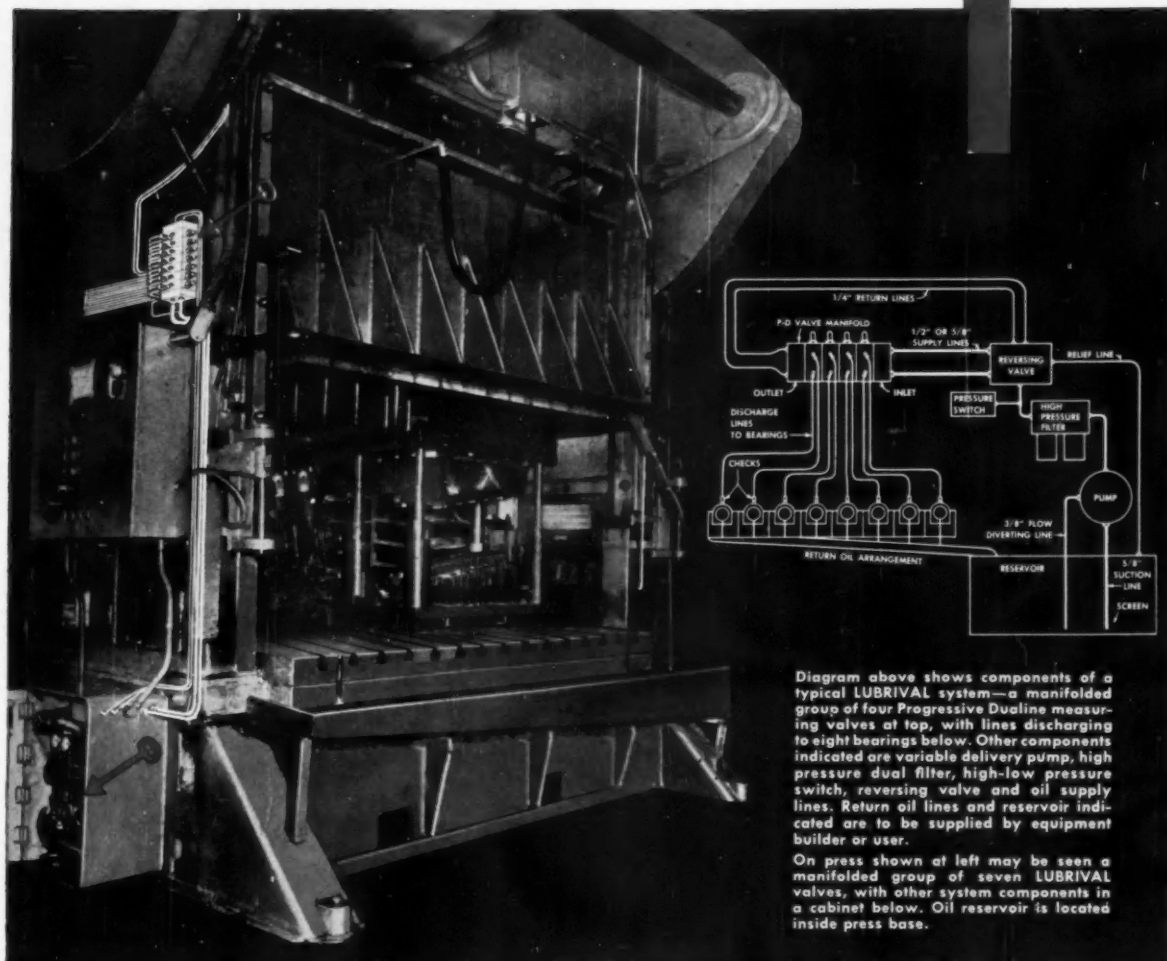


Diagram above shows components of a typical LUBRIVAL system—a manifolded group of four Progressive Dualine measuring valves at top, with lines discharging to eight bearings below. Other components indicated are variable delivery pump, high pressure dual filter, high-low pressure switch, reversing valve and oil supply lines. Return oil lines and reservoir indicated are to be supplied by equipment builder or user.

On press shown at left may be seen a manifolded group of seven LUBRIVAL valves, with other system components in a cabinet below. Oil reservoir is located inside press base.

● The bearings of this 150-ton metal stamping press and others of its type are now protected by LUBRIVAL. This new Farval system for circulating oil is being installed on many varied kinds of machine tools, presses, automated machines, and other equipment calling for circulating oil lubrication.

Employing the famous Dualine principle, LUBRIVAL delivers oil to manifolded measuring valves which feed it under pressure to the bearings. Lubricant is force-fed by positive piston displacement. Flow can be regulated over a range of 10 ounces to one gallon per minute. Valves have individual sight indicators and offer a degree of installation and operational flexibility previously unknown in such devices.

The Farval representative near you will give you all details. Or write for Bulletin 70. The Farval Corporation, 3295 East 80th Street, Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing.
In Canada: Peacock Brothers Limited.*

KEYS TO ADEQUATE LUBRICATION—

Wherever you see the familiar Dualine valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of bearings.



"NIX!

We've tried that
contact material before!"



common error in CONTACT SELECTION



Frequently, in recommending contacts, Stackpole meets the objection: "We've tried that grade before. It's no good for our equipment!"

Experience proves that such conclusions should not be reached too quickly. Certainly they should not be based on tests of only one or two contact grades.

For instance, an electrical equipment manufacturer rejected a silver-tungsten grade (made by another contact producer) because of its high contact resistance. Because of this, he ruled silver-tungsten contacts "out" of further consideration.

After considerable persuasion, a Stackpole silver-tungsten grade was finally tested and proved eminently satisfactory. *This grade, however, contained different proportions of silver and tungsten powders. Moreover, it was processed by much different methods.*

Other instances might be cited wherein prejudices against silver-graphite, silver-copper and other so-called "standard" materials were overcome by Stackpole Custom-Tailored contact grades.

Actually, Stackpole's chief contact facility is its proved ability to adapt standard materials to specific equipment. A relatively small percentage change in the metal powders used in a mix plus Stackpole's unique processing methods may make a vital difference in contact performance.

The moral then is simply this: If use of a certain contact material grade is indicated by reasons of economy, potentially desirable characteristics, ease of assembly or whatnot, the failure of one such grade only points up the need for further custom engineering.

And such failures usually provide the clues to Stackpole contact engineers as to what changes need to be made!

Stackpole welcomes the opportunity to supply convincing proof of this to quantity contact users.

STACKPOLE CARBON CO., St. Marys, Pa.

STACKPOLE

Custom-Engineered CONTACTS

Hundreds of grades in SILVER-GRAPHITE • SILVER-LEAD OXIDE • SILVER-NICKEL • SILVER-MOLYBDENUM • SILVER-TUNGSTEN • COPPER-GRAPHITE • GOLD-GRAPHITE • SILVER-COPPER-GRAPHITE • SILVER-IRON OXIDE . . . and other special material combinations mixed to exacting specifications and processed from powders.



Mack's New Intercity Bus

(Continued from page 94)

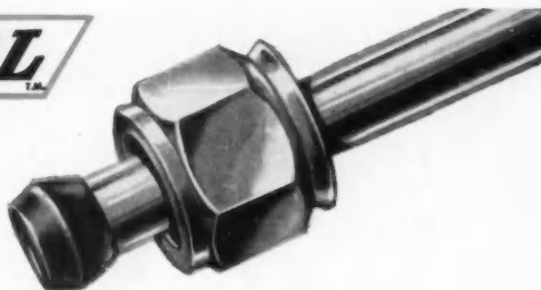
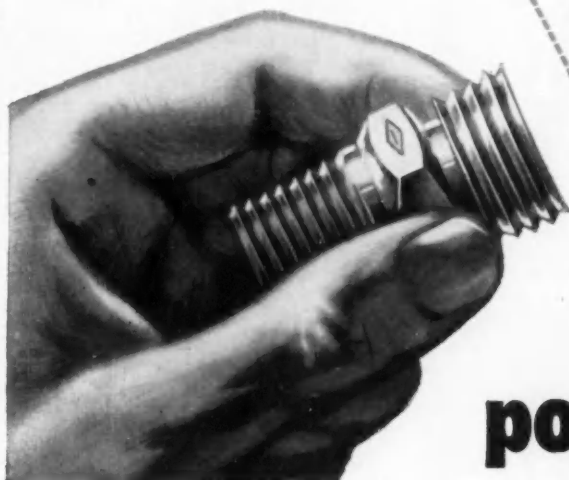
sal joints) operating at 52-deg angle to the Mack single-reduction rear axle. Spiral-bevel driven at 3.73 to 1 final ratio, the rear axle has its pinion shaft disposed at an angle of 52 deg to accommodate the diagonal drive from the transmission.

Accessory drive is from a shaft passing through the transmission and terminating in drives to the air compressor, fan, coolant pump, generator, etc. The thermostatically-controlled air conditioning system is powered by a separate four-cylinder Continental Diesel engine driving a five-ton compressor. The air conditioning unit, comprising the engine, compressor, condenser, evaporator, fans and blower, is mounted through rubber mountings under the body skirt on the right side of the bus, between the axles. Its cooling radiator is on a vertical swivel mount so that the radiator may be swung outwardly for access to the unit.

Airglide Suspension

Four rubber-and-nylon bellows on each axle support the body of the bus. These bellows are mounted on the ends of box-section members bolted directly to the bottoms of the axles much in the same manner as conventional leaf springs. Contained in the base structure of the body are metal air chambers connecting with the bellows. Air from the bus air system is supplied to these chambers through three leveling valves, one for the front axle and one for each side of the rear axle, which adjust the pressure automatically according to load in the bus. The action of these valves, as is usual in air suspension systems, is to maintain a uniform floor height above the ground under all loads and to provide a deflection rate which so increases with load that the oscillating rate and consequently the ride is identical at all loads.

Alignment of the axles is maintained, and braking and driving

IMPERIAL**HI-SEAL**

the flareless tube fitting that makes a positive butt-joint

The most important advance in tube fittings in 20 years!

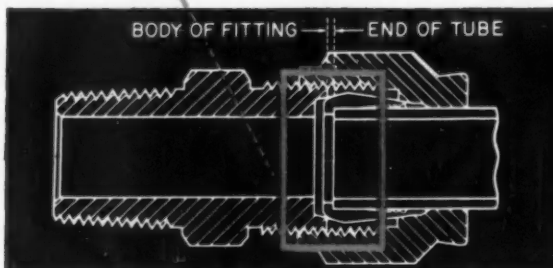
**No need to spring tubing • withstands high pressures
foolproof assembly • no flaring or threading**

Checks on typical high-pressure tubing jobs show you can cut installation time substantially with Hi-Seal fittings . . . *save up to 53% compared with flare-type fittings.* Hi-Seal completely revolutionizes high-pressure tubing installations!

Foolproof assembly! Pressure-tight joints and reconnections can be made even by the inexperienced. There's only *one* way tubing can be inserted into sleeve . . . only *one* way sleeve goes into fitting.

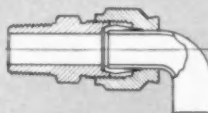
Positive butt-joint! No tube entry into body of fitting. No springing of tube. Especially important with large-diameter, heavy-wall, hard-temper tubing, or short lengths of tubing.

Closer tube bends! Butt-joint and no-flaring features mean bends can be made exceptionally close to end of tubing. Hi-Seal fittings work in close quarters where other types of fittings cannot be used!



See above how tube "bottoms" on shoulder of sleeve. Camming action of nut causes sleeve to form a collet-type triple-seal grip on tubing. Final circumferential seal is made by tapered edge of sleeve. No tube torquing when making a joint.

**MEETS J.I.C.
AND A.S.M.E.
STANDARDS
LISTED BY U.L.**



**Permits Closer
Tube Bends
Than Any Other
Fittings!**

Hi-Seal fittings are furnished in steel and stainless steel — for $\frac{1}{8}$ to $1\frac{1}{2}$ " O.D. tubing.

Write for Bulletin 3061 and complete facts.

SEE YOUR IMPERIAL DISTRIBUTOR:

for fittings and tools for copper, steel, stainless steel, aluminum and plastic tubing. He offers industry's most complete line.



37° Flare Fitting



Hi-Duty Fitting



Flex Fitting



Poly-flo Fitting



Flaring Tool



Tube Cutter



Tube Bender

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*If your product
requires
threaded
fasteners...*



Ingersoll-Rand
**ASSEMBLY
MACHINES**
can help you
save time,
money and improve
product quality

- any size bolt or screw!
- hand held or automatic!
- maintains desired torque!
- as many spindles as you want!

Contact an Ingersoll-Rand
AIREngineer now . . . he's your
link with a world leader in
automatic assembly machines.



8-521

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

torque taken, by a system of tubular radius and torque rods. At the front axle there are one upper and two lower torque rods, and one transverse radius rod. At the rear there are two lower torque rods and an upper wishbone combination. Direct-acting telescopic-type hydraulic shock absorbers are used front and rear.

Steering

Of the worm and roller type, the steering gear is mounted on the front axle beam. It is connected with the steering column by a shaft with two universal joints that is bevel-gear-driven from the end of the steering column. To provide a comfortable steering wheel angle, the upper portion of the steering column is tilted rearward at 27 deg. A universal joint is used in the steering column for this purpose.

At the lower end, the vertically-disposed cross shaft of the steering gear is connected by a pitman arm to the transverse drag link. Vickers power steering is applied directly to the steering knuckle end of the drag link; the integral valve being actuated by the pitman arm ball.

News of the MACHINERY INDUSTRIES

(Continued from page 79)

fact that we have always had fluctuations in volume in the machine tool business, and yet we have gone right on earning a profit."

In discussing the outlook for the machine tool industry, Mr. Raterman gave a brief survey of the four major markets—national defense, export, plant expansion, and replacements. He expressed the opinion that the last, namely, the replacement market, represented the biggest immediate potential source of business. In that connection, he felt sales emphasis should be on direct savings in operating costs. As the basis for "looking toward the future with a good deal of confidence" he cited three reasons: "First, the figures on age and obsolescence of ma-

chine tools now on plant floors indicate an enormous potential replacement market; second, beyond this market lies future demand for new machine tools for plant expansion projects delayed, but not abandoned; and, third, the rate of research and product development within the machine tool industry is today so rapid that a machine that many a company thinks is 'good enough' today will not be good enough for tomorrow."

Mr. Raterman concluded his talk with the comment, "Let's take today's situation in our stride, as we have so many times, up or down, in the past, firm in the conviction that we can adjust our affairs to current conditions, plan for the future, and keep on doing business at a profit."

Dr. Wm. A. Paton, professor of accounting, University of Michigan, gave a talk on the subject of "Measurement of Cost Under Inflation Conditions." He advocated that changes in the value of the dollar with inflation be taken into account when computing costs of operation and arriving at net operating results. More specifically, he stated that when the dollar is declining, unless the cost of "plant consumed" is stated in the form of current dollars, the effect is to understate the real cost and thereby overstate earnings. As an example of his recommendation—if a plant was installed at 1940 prices and the current cost level is twice the initial cost level, he contended the 1940 cost of plant consumed should be multiplied by two in determining the "true current cost" of plant consumed.

The relative merits of selling machine tools direct or through distributors were thoroughly discussed in an extremely interesting panel discussion. Frederick S. Blackall, Jr., president and treasurer, The Taft-Peirce Mfg. Co., was the panel moderator. Presenting the direct selling viewpoint were Walter K. Bailey, president, The Warner & Swasey Co., and Frank U. Hayes, vice president and assistant general manager, The Bullard Co. The distributor setup was discussed by Ralph J. Kraut, president, Giddings & Lewis Machine Tool Co., and Kenneth M. Allen, executive vice pres-

small, lightweight air hoist gives you greater **VERSATILITY**

Ingersoll-Rand
AIR-BLOC
combines
safety,
ruggedness
and
mobility...

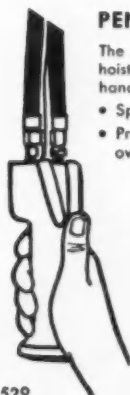
Move it anywhere . . . hang it anywhere . . . the I-R AIR-BLOC gives you versatility you never thought possible for speedy handling of loads up to 1000 pounds. No mechanical brake to fail . . . load can't drop even if air pressure fails. Responsive throttle control and automatic up-down-stop permit extremely accurate handling. There's a size just right for your job.

Portable winch-type Utility Hoists, in a wide range of sizes up to 4000 lbs., are also available from Ingersoll-Rand.

PENDENT THROTTLE

The only complete line of air hoists with convenient "one-hand" control.

- Speeds spotting of loads.
- Provides "Finger-tip" control over full range of speeds.



8-529



Ingersoll-Rand
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AIR HOISTS up to 24,000 lbs.

ident, Rockford Machine Tool Co. These advocates and users of both methods of selling reported successful operations. Principal advantages of the direct selling seem to center on undivided attention of sales representatives and low sales expense percentagewise if volume of business justifies this method of operations. The distributor method appears best for smaller companies and generally affords greater coverage of the potential market; but usually entails a

higher cost per unit of sales. In summary, the discussion closed with the general conclusion that either method can be the more advantageous depending upon the individual circumstances, and that the selection should be based in each case on a careful study of the particular requirements involved.

The following new officers for the coming Association year were elected to office during the Annual Meeting: President — Alfred V. Bodine, president and treasurer,

The Bodine Corp.; First Vice President—Ralph J. Kraut, president, Giddings & Lewis Machine Tool Co.; Second Vice President—Alan C. Mattison, president, Mattison Machine Works; and Treasurer—Graham E. Marx, vice president and general manager, The G. A. Gray Co. Walter K. Bailey, president of The Warner & Swasey Co., was re-elected Secretary.

New directors elected were Mr. Mattison, Mr. Marx, and Julian C. Pease, executive vice president, The New Britain Machine Co. Ludlow King was re-elected Executive Vice President of the Association.

GOSHEN GORBOND*

*Trade name for Goshen's exclusive bonding process.

sets a new standard of excellence in

RUBBER-TO-METAL ADHESION

developed and offered exclusively by



Goshen Rubber

If your problem is finding really dependable adhesion of a rubber compound to metal, then Goshen's exclusive bonding process, GORBOND, is for you. Parts made of natural, synthetic and silicone rubber compounds are being regularly bonded securely to metals of most every type . . . in a manner to meet the most exacting tolerances as well as material and performance demands. This superior process allows engineers wider freedom to employ the simplified design and lowered end costs possible through rubber-to-metal bonding of unexcelled reliability.

Write for Technical Bulletin No. 9

See our catalog in
Sweet's Product Design File.

PUT *Goshen Rubber* TO WORK FOR YOU

GOSHEN RUBBER CO., INC. 2711-7 S. TENTH ST. GOSHEN, IND.



Snyder Tool Expands, Adds New Facilities

Howard N. Maynard, president of Snyder Tool & Engineering Co., has announced completion of a factory expansion program designed to provide new and larger floor space for assembly, and electrical and hydraulic component operations. The latest addition is the second phase of a program for the company's main assembly plant at Detroit, Mich., which began with a \$600,000 assembly area addition completed during 1955.

The new 5,520 sq ft building will give the company increased facilities for building electrical control panels and hydraulic piping systems for its automated machines.

Brown & Sharpe to Sell Lipe AML Bar Feed

An agreement has been made by Brown & Sharpe Mfg. Co. with the Lipe-Rollway Corp. to market the latter's automatic magazine loading bar feed for installation on B & S single-spindle automatic and hand screw machines. The agreement permits B & S to install, service, and maintain the Lipe bar feed, along with the screw machines, anywhere in the United States and Canada. Lipe will also continue to sell the unit through its distributors.

The AML bar feed holds up to eight hours' supply of bars, rods or tubing, loading and feeding the stock automatically to a predetermined stop.

BAUSH "SPECIAL" 3-WAY UNIT

DRILLS, ROUGHS, AND FINISH FORMS
SPARK PLUG HOLES IN CYLINDER HEAD —

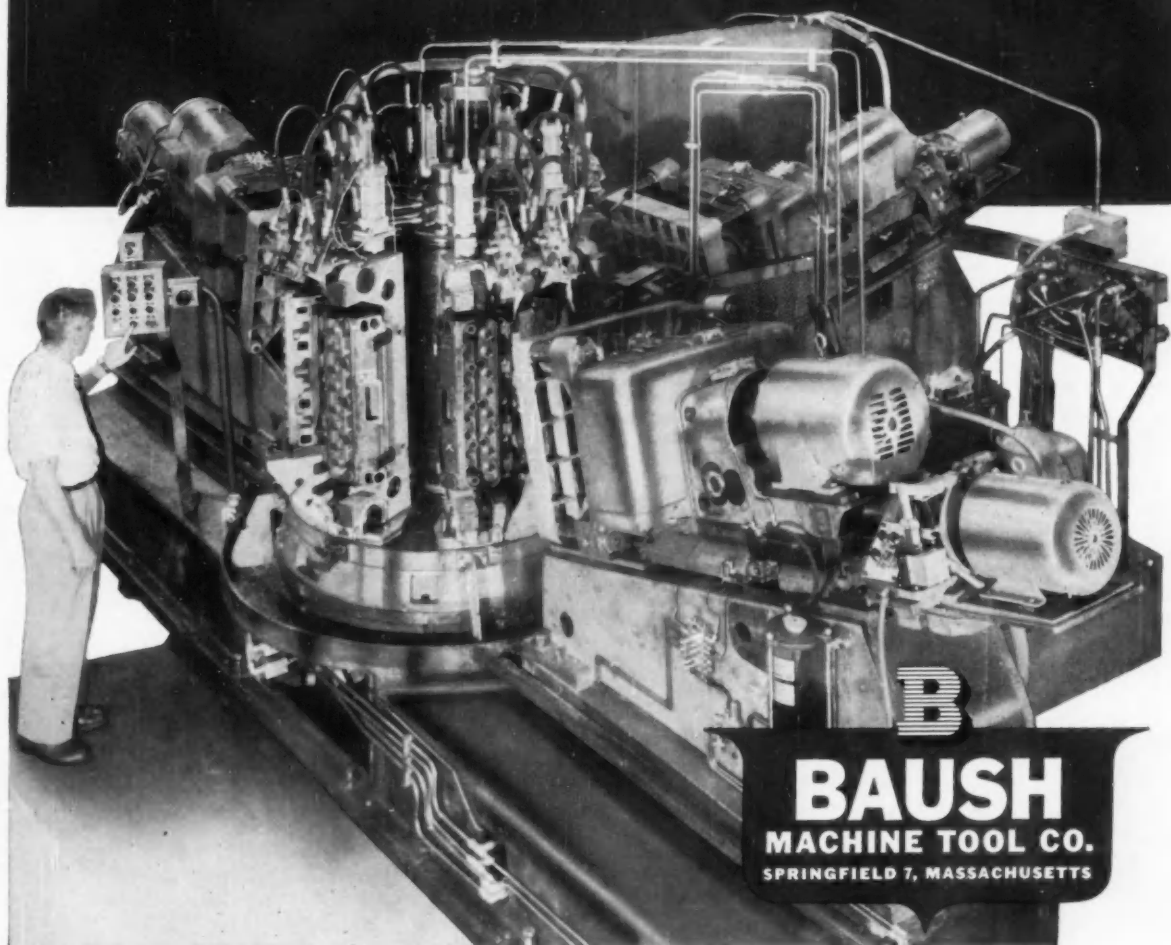
It is one of several different machines we have designed and are producing to complete a cylinder-head production line for a leading automotive manufacturer . . . resulting from past proven performance of other Baush units designed for specific jobs in this plant.

If you are thinking of AUTOMATION — THINK OF BAUSH. Our experience is yours — we'll gladly help with your machine tool problems.

SPECIFICATIONS:

Unit has 50" diameter, 4-station semi-automatic rotary table with a 2-position, 4-station fixture, plus full Trabon Lubrication. Three (3) 35° Vertical Angular Model "S" Mechanical Leadscrew units, each having a 4-spindle fixed center head, are mounted on a welded steel center base. Chip conveyor runs through machine.

Part is manually loaded into fixture and hydraulically located and clamped. Fixtures are equipped with guide bushing for tools and bars register in holding units when part is in machining position.





FELLOW VISIONARIANS: K&E Albanene® Tracing Paper keeps your originals clear for life . . . substantially lowers your operating costs.

K&E Albanene has more desirable working qualities than any other tracing paper. Its superiority begins with the stock—100% rag paper with the longest fiber in the business, made only for K&E. This gives Albanene its extraordinary tear strength with the greatest possible transparency. Original drawings stand up year after year under repeated reproductions without damage or loss of clarity.

Albanene is permanently transparentized with an inert synthetic resin exclusive with Albanene . . . accepts pencil and ink equally well. Ink lines never spread or feather. What you pay for stays in the paper. It will pay you in lower operating costs to specify K&E Albanene® . . . the largest selling tracing paper in the world. For other drafting or engineering equipment and materials also look to Keuffel & Esser Co.—your “Partners in Creating”—who have served engineering for 90 years.



KEUFFEL & ESSER CO. New York, Hoboken, N.J., Detroit, Chicago, St. Louis, Dallas, San Francisco, Los Angeles, Seattle, Montreal.

SHORTIES

A new tactical jet bomber uses approximately 1345 lb of stainless steel—enough to manufacture more than 89,600 kitchen paring knives.

Total free world nickel-producing capacity will approximate 650 million to 675 million lb in 1961, or about 50 per cent above that in 1956.

During the 13-year Federal highway program, roadbuilding machines will use more than 13 million gal of petroleum products of all types.

In 1956, 58,160 total wells and 31,160 oil wells were completed in the U. S. This rate of drilling maintained over a decade should develop more than 40 billion barrels of new oil.

Farmers buy 17 per cent of the tires sold in the United States, 20 per cent of the batteries, and about 20 per cent of all the motor gasoline.

During the past 25 years, the available future supply of oil has consistently been maintained in the ratio of 11 to 15 times annual production.

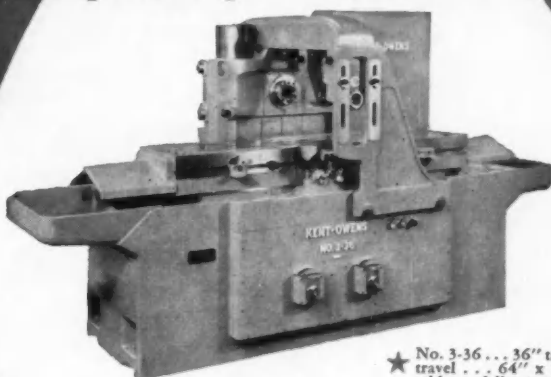
A recent survey shows that more than 54 per cent of all cars that stop off at a service station need a change of oil.

U. S. motorists and fleet owners bought at least 107 million gal of antifreeze solutions last year to keep the cooling systems of their vehicles from freezing up in winter weather.

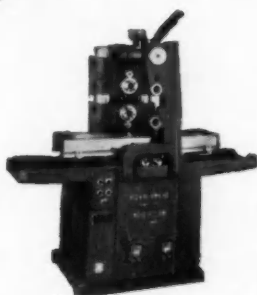
Since 1930 research has grown from a \$300 million-\$400 million activity to a \$6 billion industry employing over 500,000 persons.

Every one a Star

for speedy accurate milling!



★ No. 3-36 . . . 36" table
travel . . . 64" x 16"
table . . . full automatic
hydraulic feed.

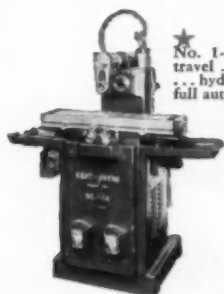


★ No. 2-20DS . . .
Double Spindle for
two milling opera-
tions . . . 20" table
travel . . . 42" x 12"
table. Hydraulic feed.

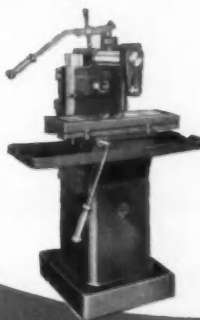


★ No. 2-20 . . . 20"
table travel . . . 42" x
12" table . . . full
automatic hydraulic
feed.

You'll turn out milling jobs with stepped up speed and accuracy with the work on Kent-Owens Machines! These extra-rugged Millers are performance-proved . . . simple . . . versatile . . . practical in every detail. Advanced features throughout! Twin-post head mounting assures balanced load. Only two gear contacts, motor to spindle, means greater cutting efficiency. Check your needs! Write today for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.



★ No. 1-14 . . . 14" table
travel . . . 32" x 9" table
. . . hydraulic table feed . . .
full automatic cycle.



★ No. 1-M . . . Hand
feed to table and
head . . . 25" x 9"
table travel . . . head
counter-balance is
adjustable.

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General Machinery Corp.

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ACCIDENT REDUCTION IN PLANTS

Discussed at
National Safety Congress

PLANS intended to cut down the number and seriousness of accidents in plants were discussed at the 45th Annual National Safety Congress and Exposition, held in Chicago Oct. 21-25. In the Automotive and Machine Shop Divi-

sions, and the Power Press and Forging Divisions, several representatives of the automotive manufacturing industries presented their ideas.

Some rules for the safe operation of industrial furnaces were

offered by Lawrence L. Jaffe, supervisor of the Manufacturing Research Laboratory of Frigidaire Div., General Motors Corp., in his talk. They were: 1) Make sure the equipment is safe and includes all necessary safety devices. 2) Buy new equipment with all the necessary safety devices attached. 3) Inspect safety devices regularly and keep them in good operating condition. 4) Be sure everyone involved in operating furnaces and heat-treat equipment follows approved procedures. 5) Make sure piping and valves are adequately identified.

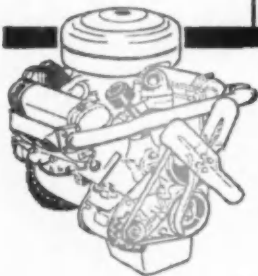
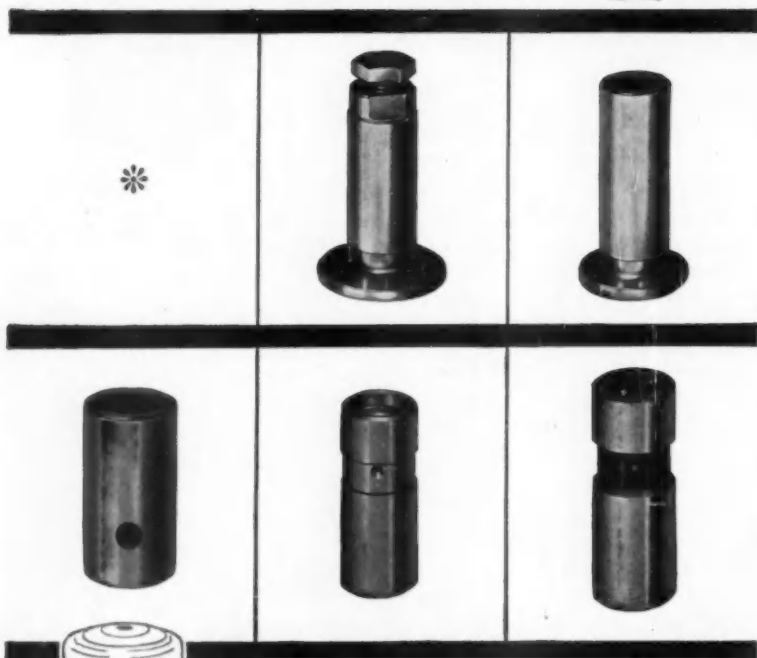
Operator training is important, too. "Even though a furnace is equipped with the latest and best safety devices, a well-trained operator still is necessary for its safe operation," he said.

Safety should be included in the master operating plan for a plant just as much as production capacity, quality standards, and sales objectives, J. B. Hynes, safety supervisor for Oldsmobile Div. of General Motors Corp., told the group. "With safety a part of the master plan of operation, there is no need for safety drives and campaigns or safety weeks and contests to keep it going," he said. It should be a continuing campaign, not a series of starts and stops.

W. A. Crickmore, supervisor of plant layout, material handling, and special assignments at Oldsmobile, stated that safety isn't really complex, and can be reduced to a few basic principles. There are two kinds of hazards, mechanical factor hazards, accounting for 20 per cent of industrial accidents, and personal factor hazards, which account for 80 per cent. The first type can best be handled by eliminating them in designing a machine or setting up a process. The engineer, when designing a machine, should take into account the people who will operate it. "Accident prevention isn't really complex. It's a multitude of simple little problems involving a mixture of buildings, equipment, machines, and people."

"Youngsters are entering a strange new world when they take their first jobs," R. L. Hargraves, district engineer of Hartford Ac-

JOHNSON *tappets*



** keep pace with today's engines*

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration.

Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance.

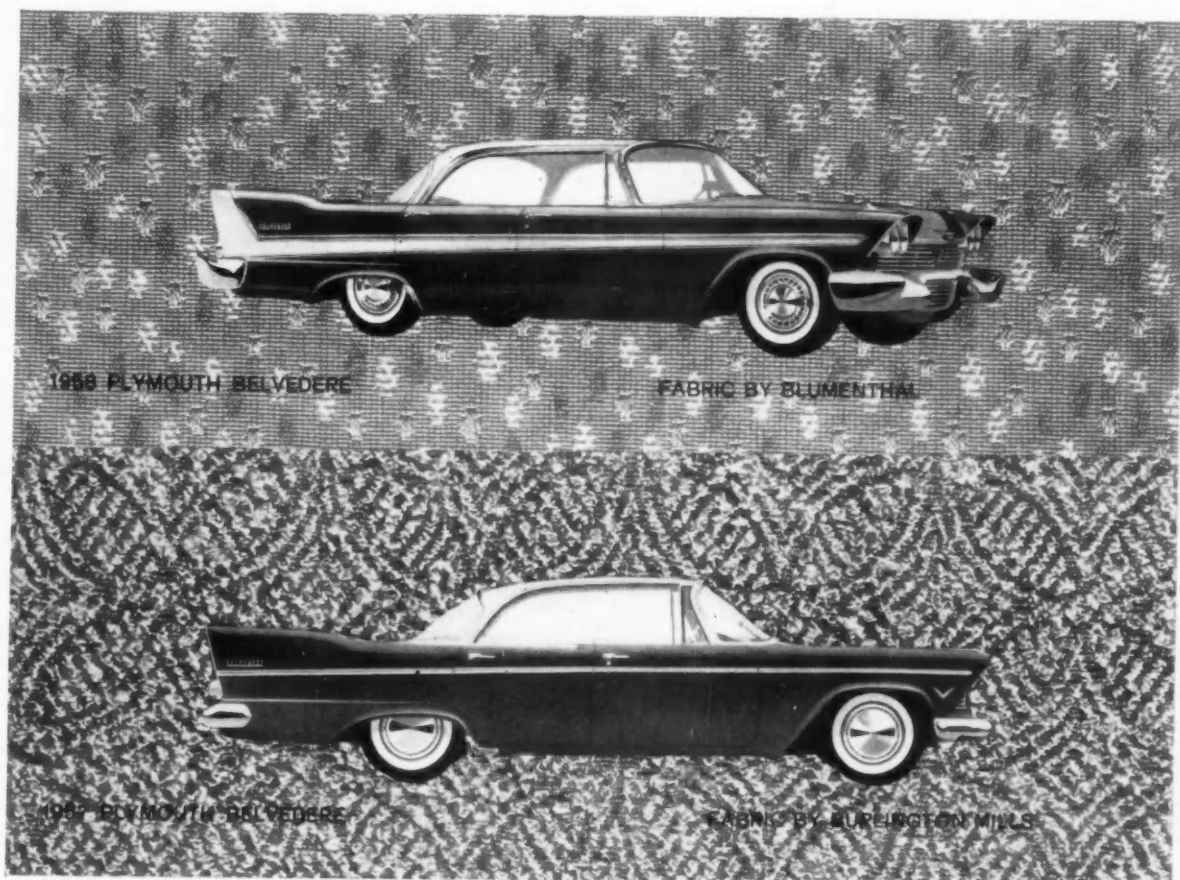
Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

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MUSKEGON, inc. MICHIGAN

Inside story of the new 1958 Plymouth Belvedere:

The upholstery fabric again is made with I-R-C Continuous Process Rayon!



Plymouth's eminence as star of the Forward Look is the result of forward *thinking*. Every part of this beautiful car—both inside and out—must measure up to the highest standards of appearance and serviceability...to provide the best in ultra-modern performance.

That's why again for '58, as in 1957, Plymouth's Belvedere features superb upholstery woven from IRC Continuous Process Rayon.

Weavers of "critical" fabrics know that Continuous Process Rayon holds the record for making first quality goods. No other yarn dyes so evenly, with the same color density, and without streaking, shading, or band-filling.

Why not end *your* problems of weaving breakdowns...specify Continuous Process Rayon!

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Industrial Rayon Corporation
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Producers of Continuous Process Rayon Yarns
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ON CONES

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Use IRC Continuous Process Rayon...uniform mile after mile...perfect inch by inch...and it costs no more!

cident & Indemnity Co., told the group. "Good supervision can aid youth by developing in them work habits and attitudes which will help them in the whole course of their productive life." Some 7 million teen-agers work today, part time or full time. In showing them how to do a job, the supervisor should also tell them why it's done in a particular way, so that their natural curiosity and liking for experimentation can be guided into useful channels.

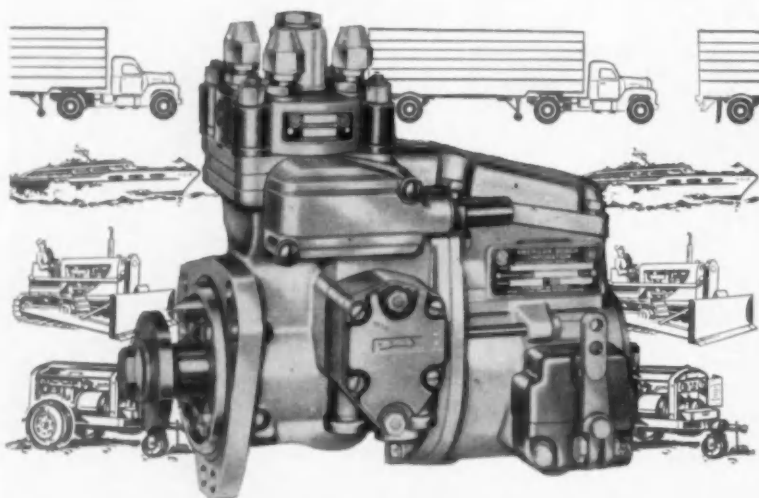
Management Sessions Featured at Semi-Annual Meeting of AGMA

THE 1957 Semi-Annual Meeting of American Gear Manufacturers Association reflected the growing interest of association members in management information. There were more management sessions than in the past. About 225 members

were present at the meeting which was held Oct. 27-30 in Chicago.

C. W. Stewart, president of Machinery and Allied Products Institute, gave a paper, "Business Investment Policy — Equipment Analysis as an Aid to Management," in which he discussed the application of the MAPI formula, developed by George Terborgh, for determining the economic point of replacement for machinery and equipment. The formula takes into consideration the rising cost of operation of the equipment, due to deterioration, obsolescence, the cost of recovering capital invested, or depreciation, and the cost of the capital, or interest.

In another paper, entitled "No Money for New Machines?," J. H. Robins, president of American Pulley Co., described the method adopted by his company for planning and financing purchase of new equipment. Starting with the axiom that a business must include in its selling price adequate provision for replacement of its equipment, Mr. Robins stated that his company's officials did not feel beholden to accounting, were not subject to SEC regulations, and were not willing to let the Internal Revenue Act become a tail to wag their company dog. They thereupon set up a procedure for purchasing needed equipment and financing it that did not conform to standard methods. Starting with an analysis of all company machinery and equipment other than modern, they guesstimated upon the future life of each such item, tabulated this information, and determined from these data the total estimated excess costs of new equipment over regular depreciation year by year. This information was used as a starting point for the replacement part of a budget of capital expenditures, and a more detailed analysis was made of each item. A plan was set up to provide the money for these excess replacement costs by charging the cost of sales, month by month, with about 1½ to 2 per cent



Key to top performance . . . the PSB fuel injection pump

The PSB Fuel Injection Pump has established an unmatched record for dependable and economical diesel engine performance.

Proven design—here's a fuel injection pump with fewer parts and simple construction, employing positive governor control and a replaceable hydraulic head for fast field servicing.

Outstanding operating economy—from precise fuel metering and accurate distribution . . . the PSB Fuel Injection Pump's efficient design and careful manufacture assure long, trouble-free operation with minimum maintenance.

Backed by low-cost repair service—from "original-maker" repair by factory-trained experts at Authorized American Bosch Service Stations . . . nearly 200 in North America, Hawaii, and Puerto Rico . . . all equipped with special tools and test equipment, and stocked with genuine American Bosch replacement parts.



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unusual advantages to
Original Equipment
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Specialized experience in the design and production of automotive ball bearings—plus a very high degree of manufacturing flexibility—are features of BCA service that are unusually helpful to original equipment manufacturers. When you do business with BCA, you can expect improved product performance and real production economies—worthwhile advantages, indeed. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

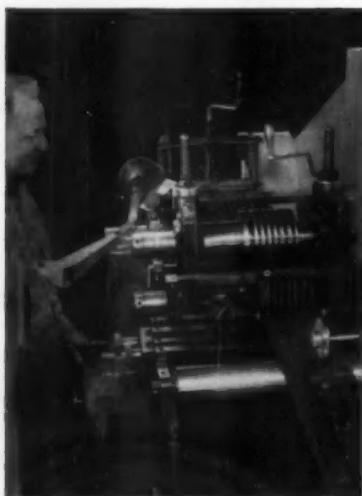


FREE! BCA "Engineering Handbook." Available to engineers without cost. Write on your company letterhead.



BEARINGS COMPANY OF AMERICA
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Federal-Mogul-Bower Bearings, Inc.





YODER SLITTERS Supply Varied Strip Widths for Tinnerman *Speed Nuts*

Tinnerman Products, Inc., Cleveland, Ohio, produces more than 10,000 different shapes and sizes of "SPEED NUT" brand fasteners for industry . . . many of them to special specifications.

To do this, Tinnerman uses slit steel strands ranging in width from $\frac{1}{8}$ " to $7\frac{1}{2}$ ". To carry an inventory of the many strip widths required to meet normal and unusual demands would be almost impossible.

Tinnerman overcomes these inventory and supply problems by doing their own slitting on two Yoder slitters. This enables them to supply the plant with any strip size required from a relatively small inventory of 6" and 9" width purchased coils. In slitting narrow strands, such as these from small coils, a Yoder slitter may be profitable on a production as low as 25 tons per month.

Here is a fine example of how a small investment in Yoder slitting equipment greatly simplifies and speeds production while effecting important operating economies.

The saving made in time alone, reflects in better customer service through faster completion and delivery of finished products.

If your steel strip or sheet slitting requirements are as low as 100 tons per month or even less, a medium size Yoder slitter can be a very profitable investment for you. The Yoder line includes units of every size and capacity . . . of the most advanced engineering design. Send for the Yoder Slitter Book—a comprehensive text on the mechanics and economics of slitters and slitting line operation, with time studies, cost analyses and other valuable data. Write to:

THE YODER COMPANY

5553 Walworth Avenue • Cleveland 2, Ohio



and placing the money in a capital asset replacement fund.

Since 1947, when the original study of company equipment was made, about \$500,000 was accumulated, and most of it was spent on new machines and equipment. In 1952 the company drew on the fund for excess equipment costs that year, and continued to replenish the fund by a charge to cost of sales. Over the past 10 years the company has replaced at least half its equipment, and can predict just how much it will spend on machinery replacements during the next 10 years. It was found in 1955 that the five-year projection period could be extended, and for any company starting from scratch a 10-year look is advised instead of the five-year projection.

Cautions were sounded for other companies that might consider using the same procedures. The company's accounting department would need approval of the board of directors to carry out the plan; companies subject to SEC regulations would need the approval of that agency also, as it requires accounting of approved companies to conform to Regulation SX.

Merhyle F. Spotts, professor of mechanical engineering at Northwestern University, and Edward C. Varnum, of Barber-Colman Co., presented a paper upon "Contact Ratio of Hobbed Spur Gear Teeth," in which they analyzed the conditions for smooth operation, and the effects of undercutting. Tables of contact ratios for $14\frac{1}{2}$ deg and 20 deg pressure angles were set up giving contact ratios for number of teeth per gear.

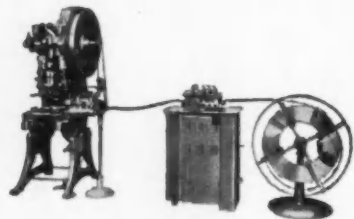
Gear inspection, wear studies, and data tabulation were the subjects of other papers. The Automotive Gearing Committee, headed by William D. Route, of Chevrolet Div. of General Motors Corp., organized its plans for future work, and the Aircraft Gearing Committee, headed by D. W. Dudley, General Electric Co., discussed some of the new nonferrous materials now under study for gears, including titanium, aluminum, bronze, and nylon. Air Force reports upon aircraft gearing have recently been released, it was announced, and the information in them will be available for additional studies.

FLEXIBILITY in Stock Straightening



WITTEK STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.



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Here's the BIG BONUS

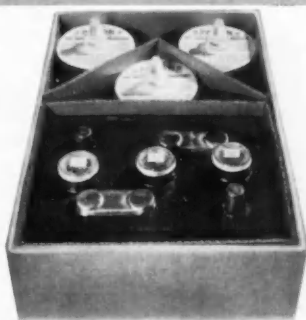
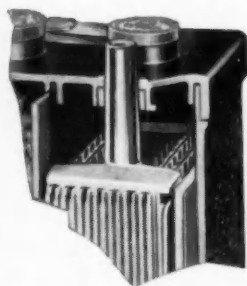
in the rugged Globe thin-wall plastic battery case

- Globe's bonus acid capacity puts extra power and life into same overall dimensions.
- Thin-wall plastic case also adds 96% more resistance to impact — 40% greater resistance to acid penetration — over standard composition cases.
- Perfected after 10 years of exhaustive research.

comparative acid in Globe battery ➤

21% MORE ACID

comparative acid in composition wall battery ➤



Other big Globe bonus features too:

Unitized one-piece cover-case construction . . . brute for strength . . . high resistance to handling damage, to road shock, to under-hood heat distortion . . . more protection for vital battery parts . . . tongue and groove joint weld-sealed into one inseparable unit.

Creative packaging of dry-charged batteries delivers all ingredients together — for swiftest, simplest battery activation known. Unbreakable, disposable plastic bottles contain the correct amount of electrolyte. No waste, no measuring, no guesswork. Safe and fast.

Faster, lower-cost delivery from sixteen strategically located plants — fourteen (*) now producing dry-charged batteries.

*Atlanta, Ga., *Dallas, Texas, *Emporia, Kansas, *Houston, Texas, *Louisville, Ky., *Medford, Mass., *Memphis, Tenn., *Milwaukee, Wis., *Mineral Ridge, Ohio, *Philadelphia, Pa., *Reidsville, N.C., *San Jose, Calif., *Hastings-On-Hudson, N. Y., *Los Angeles, Calif., *Oregon City, Ore., *Ajax (Ontario), Canada.



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If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

New Developments Described at National Conference on Industrial Hydraulics

By Kenneth Rose

Nearly a thousand executives and engineers heard discussions of hydraulic equipment for aircraft, tractors, and other automotive equipment, and for in-plant use, at the 13th Annual National Conference on Industrial Hydraulics in Chicago last month. The conference

was sponsored by the Illinois Institute of Technology, several engineering societies, and more than 100 industrial organizations.

High Pressure Pneumatics

Speaking upon "New Design Concepts for High Pressure Pneumatics Systems," T. H. Chadwick

and Paul L. Brady, of Convair Div. of General Dynamics Corp., mentioned the growth of control systems in modern aircraft. While compressors on the market are capable of delivering as high as 12,000 psi, aircraft pneumatic systems are currently using nominal storage pressure of about 3000 psi, which can be contained in relatively lightweight fiber and plastics containers. The 5000 psi pressures likely in the future can still use fiber and plastics bottles.

According to the authors, actuating cylinder operating pressure should be the highest commensurate with initial storage pressure, capacity, and weight, as only about one-half of the stored energy is usable. This gives a practical 1100 to 1500 psi. Theoretical load capability of the cylinder is dependent upon operating pressure times effective area, but some excess power should always be available for cylinder movement control.

Suspension for Off-Highway Trucks

"The LeTourneau-Westinghouse 'Hydrair' Suspension" for off-highway earthmoving trucks was described by Ralph H. Kress, LeTourneau-Westinghouse Co. A suspension unit, incorporating a stationary cylinder fastened to the frame and a moving piston, secured to and operating with the wheel, is used with each wheel. The large compression chamber in the cylinder above the piston head contains a layer of oil for lubrication, and the space above the oil is filled with inert compressed dry nitrogen gas. The space below the flanged head of the piston, and at its outer circumference, is a circular chamber filled with oil. A tube connects this chamber with the interior bore of the lower piston, and a valve at the bottom of the piston controls the flow of oil from the chamber to the interior of the piston, making the whole unit a two-way shock absorber. Compressed nitrogen in the interior of the piston helps in this shock absorption.

High Temperature Hydraulic Systems

Some of the problems of present-



Convert lift trucks to Century LP-Gas Carburetion



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CENTURY PROVES BEST for Towmotor's LPG Model 350 Lift Trucks ...best in performance...best in fuel economy...and best in compact design.

Century proved its performance and efficiency to this outstanding leader in the industrial truck field through a series of laboratory and field tests.

Now as factory standard on this popular Towmotor model, you will see the complete Century Carburetion system consisting of a Model 3C-702 Carburetor, Model H Converter and STF-1614 Filter-Fuelock.

Follow the lead of the big manufacturers, when converting lift trucks and other motorized equipment to LP-Gas—select Century LP-Gas Carburetion for top performance. Write for brochure.



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LP-GAS CARBURETION

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6855 East Rosecrans, Paramount, Calif.



"We grind no axe . . . and really have no need to." After all, Bliss makes so many types and sizes of metalworking presses — actually many more than any other builder — that we favor only the one right press for your job. It may be a big one, a little one, a mechanical, a hydraulic, a standard or a special. But you can be sure it will be the *right* one.

If you have a pressed metal problem, isn't it logical to talk to a source that's certain to give you an impartial answer? To talk to Bliss?



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100 years of making metal work for mankind

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day aircraft systems design were outlined by Frederic H. Pollard, of Republic Aviation Corp., in his talk, "High Temperature Hydraulic Systems Development." High speed, engine heat, and the heat developed in the hydraulic system itself were given as the reasons for temperature requirements in the system. Specification MIL-H-5440 recognizes two classifications above 160 F, with top temperatures of 275 F and 400 F, but ranges of 550 F and 700 F are being studied, and a cur-

rent contract calls for development of a system to operate at 1000 F. Petroleum base hydraulic fluid has a top usable temperature of about 275 F; silicate ester base fluids get most attention for the 400 F-550 F range, with Monsanto OS45, Type III, and Oronite 8515 for the former, and Monsanto OS45, Type IV, and Oronite MLO 8200 for the latter. G. E. Versilube F-50, a silicone base fluid, is being tested for about 700 F. Above 700 F such liquid metals as Nak, a sodium-

potassium combination, are getting some attention.

Packing rings of Buna-N synthetic rubber have been compounded for service to 275 F. For higher temperatures other elastomers or metallic packings must be used. Neoprene WRT, polyacrylic, and poly-FBA (fluorobutylacrylate) were tested at 400 F, and then the polyacrylin and poly-FBA were tested at 450 F. A new elastomer, Viton-A (vinylidene fluoride hexafluoropropylene copolymer), did well at 550 F, and should be good to 600 F. At the low temperature end, Viton-A was satisfactory at -65 F, while poly-FBA had a minimum usable temperature of -30 F. Back-up rings of Teflon, loaded with glass fibers, and the same elastomer loaded with ceramic fibers and molybdenum disulphide, did best.

Valves and cylinders of aluminum alloy lose strength at 400 F and higher, so that components of stainless steel, usually of the 400-series, are now used. For still higher temperatures, Inconel-X and tool steels are chosen. Titanium plated with chromium gave excellent results in an actuating cylinder.

Hydraulic Servo for Automobile Accessories

Public demand for power accessories in automobiles is creating serious space and engineering problems, said W. J. Payne and F. N. Beauvais of Ford Motor Co. in their paper, "Hydraulic Servo Gives Constant Speed for Automotive Accessories." A special drive having compensation for variations of accessory horsepower demand and engine speed, and an initial step-up of at least 2 to 1 for low-speed conditions, was decided upon. Automatic speed control using a velocity feedback network was designed to operate all accessories at constant speed above 1500 engine rpm. Below the control speed, accessories are driven in direct ratio to engine speed, the ratio being determined by pulley ratio selected.

The transmission is a combination of planetary gearing, with a relatively simple all-hydraulic servo control, and having infinitely variable
(Turn to page 185, please)

Depend on EUREKA RADIATORS for RUGGED ENDURANCE & MAXIMUM COOLING

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DIAMOND TYPE

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3/32" x 3/4"
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RB&W FASTENER BRIEFS

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Technical-ities

By John S. Davey

Fastener coatings

Salt spray testing of various metallic coatings used on fasteners doesn't always give a true picture. In actual service, accelerated test results are not always borne out.

Reason: The tests favor the coatings which can endure continuous moisture and salt atmospheres, whereas some do better under the normal intermittent dry and wet conditions of weathering.

Experience has developed a "scale" of suitability of various coatings for fastener protection.

FOR RUST PROTECTION

Hot galvanizing offers greatest endurance under most conditions. It falls short on highly stressed fasteners.

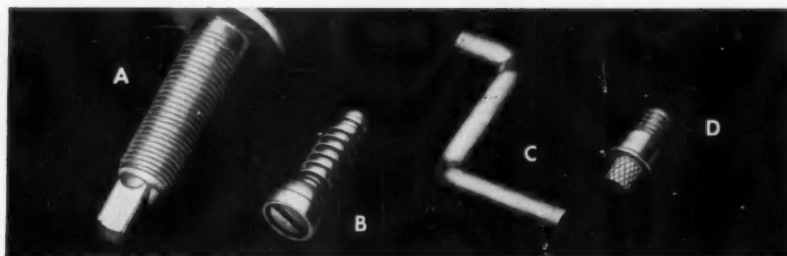
Electrodeposited zinc is next most practical—providing good appearance, controlled tolerance at threads, and ability to take high bolt tensions.

Cadmium plate stands out where salt atmospheres predominate. Not suitable for contact with edibles, it is ruled out for many appliances.

For general applications, the rust prevention of black oxide coatings proves satisfactory. Phosphate coatings, too, offer some degree of protection, but not under severe conditions.

Chromium, plated over copper, should be considered more for its appearance on fasteners rather than protection.

Cold heading creates quality parts the low cost way



No value analysis of product components is really complete without exploring what cold heading machines can do to cut costs. Some examples:

A. ELIMINATE EXTRA OPERATIONS. Leveling screw, formerly made by riveting flat disc to set screw, now emerges as a stronger, single piece from a cold header.

B. ONE PIECE BETTER THAN TWO. Cold headed hose clamp screw has integral flange which, after head is slotted, is forced up to form screw-driver shield. Before, piece was in two parts . . . with screw made on screw machine, and the shield a stamping fitted around head during assembly.

C. FASTER THAN FORGING. Shifter lever is bent into double "L" automatically in bolt header . . . replacing

ing 2-stage forging operation. The header does it at high speed from continuous rod.

D. METAL FLOWS TO SHAPE—NO WASTE. No longer cut on screw machine, insert screw for plastic parts costs 40% less. Cold header uses just the amount of metal required. The threading and knurling, too, are done automatically at high speed.

Metal forced to cold flow into shape results not only in savings but also in stronger parts. With uncut flow lines, the piece is better able to withstand stress concentrations.

For an expert opinion on parts you now use, check with Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

12-point fasteners cut wrench clearance space

Double hex RB&W bolts and nuts measure smaller across their points than single hex fasteners. Used with an external socket wrench, they permit optimum driving torque to be applied.

Thus, while permitting design of more compact assemblies, these fasteners also assure proper preloading for stronger connections.

Available with plain flange, or SPIN-LOCK design which incorporates teeth that embed upon tightening and resist loosening under vibration or temperature changes.





Speed Control Problems?

**Let the Dynamatic Man
Help You . . .
He's an Expert!**

More than likely the Dynamatic representative in your locality has had experience with a speed control problem about the same as yours. At any rate, he'll be glad to sit down with you and help work out the most practical and economical solution.

Dynamatic Eddy-Current Equipment—Drives, Brakes, Couplings—is solving speed control problems in every major industry, both in factory installations and on new equipment. Almost certainly some combination of these units will solve YOUR problem.

Your Dynamatic representative is fully qualified to make an intelligent appraisal of your problem, and suggest an application of Dynamatic Equipment that will do the most effective job for you. He has the background and experience to approach your problem with complete understanding. Why not call or wire the Dynamatic representative nearest you today—there's no obligation.



*Illustrated Literature Describing Dynamatic
Speed Control Equipment is Yours for the Asking*

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H. H. Cardozo, 5469 Main Street

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G. M. Wallace & Company, Box 208

CHARLESTON, WEST VIRGINIA

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918 Kanawha Blvd. East

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Electro-Motion Corp.
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CHICAGO, ILLINOIS

Eaton Manufacturing Company
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CINCINNATI, OHIO

Gregg & Spohn, 1416 Bonnell Ave.

CLEVELAND, OHIO

Eaton Manufacturing Company
13600 Kuhlman Ave.

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Gregg & Spohn, 1738 Fifth Ave.

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Lynn Elliott Company
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DENVER, COLORADO

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324 Denham Building

DETROIT, MICHIGAN

Eaton Manufacturing Company
10208 West McNichols Road

(Continued on following page)

DYNAMATIC REPRESENTATIVES (Continued)

FLINT, MICHIGAN

Henry Electric Company
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GRAND RAPIDS, MICHIGAN

E. B. Dewey Company
314 Straight Ave., S.W.

HOUSTON, TEXAS

Lynn Elliott Company
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Gregg & Spohn, 5416 College Ave.

KALAMAZOO, MICHIGAN

E. B. Dewey Company
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KANSAS CITY, MISSOURI

Boyd Goodhart & Associates
Merchandise Mart Bldg., 2201 Grand Ave.

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Cardinal Carry Co., Inc.
930 East Mason Street

MEMPHIS, TENNESSEE

Tom Jones, Mfr's Rep.
651 South Cooper Street

MIAMI, FLORIDA

The Gearhart Company
9731 Dominican Drive, Cutler Ridge

MILWAUKEE, WISCONSIN

Albert F. Korf & Company
3545 North Maryland Ave.

MINNEAPOLIS, MINNESOTA

Bemis Johnson Company
1645 Hennepin Ave.

MONTREAL, QUEBEC, CANADA

George Rumble Company, Ltd.
590 St. Paul St. West

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Mid-South Sales Company
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Gregg & Associates, U. S. Route 47,
Box 329, Caldwell Twp., New Jersey

NORTHBORO, MASSACHUSETTS

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PASADENA, CALIFORNIA

Shaw Engineering Sales Co., Box 590

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Eaton Manufacturing Company
5921 North Broad Street

PITTSBURGH, PENNSYLVANIA

J. A. Malady Company
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Donal Company, Box 7013

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National Conference on Industrial Hydraulics

(Continued from page 182)

able ratios. Basic velocity sensing is accomplished by flow measurement, using a pressure differential across a fixed orifice to actuate a simple bypass valve. Pressure taps in the pump housing pick up the existing pressure differential. When accessory speed reaches a desired maximum, the pressure differential has reached a valve that causes a change in the ratio control motor valve circuit.

Tractor Steering System

In his paper, "The Hydraulic Steering System of a Two-Wheel Tractor," Thomas E. Hrodey, Caterpillar Tractor Co., described the system used by his company. Its two pairs of hydraulic cylinders are arranged to work simultaneously to turn the tractor approximately 90 deg relative to the scraper. These cylinders are arranged so as to double the turning torque as compared with a single pair of cylinders. Steering control supplies fluid pressure to the cylinders only when the steering wheel is being turned, and rate of fluid flow to the cylinders changes in response to the speed at which the steering wheel is turned.

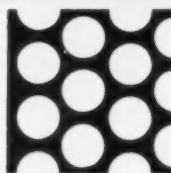
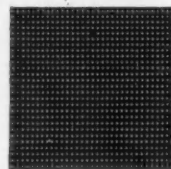
The system uses a closed reservoir, and consists of a hydraulic tank, pump, filter, control valve, steering gear assembly follow-up mechanism, hydraulic cylinders, and the necessary lines and fittings. When making a turn to the right, oil under pressure is directed to the head end of the two cylinders on the left side of the tractor and scraper. This extends the piston rod from the cylinder, increases the distance between the anchor points of the cylinders, and causes the tractor hitch assembly and independent steering arm to pivot to the right by rotating on the king-bolt. The tractor must follow the hitch and move to the right. During this time similar action, but in reverse, has been taking place with the two cylinders on the right side of the tractor, decreasing the distance between cylinder anchor

H&K PERFORATED MATERIALS

Utility • Beauty • Economy
FOR TOMORROW'S PRODUCTS

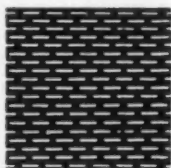
A MEDIUM OF LIMITLESS APPLICATIONS

Designers are discovering an ever-increasing range of applications for perforated materials. For functional or decorative purposes, or where a combination of both is essential, H & K perforated materials are used in more products, in more accessories, in more places than ever before.



REDUCES TOOLING COSTS

Design, pattern and open area for almost every application may be selected from our thousands of perforating dies—at no charge for tooling. (Tools for special designs can be built to order.)



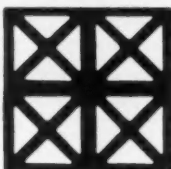
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Harrington & King can perforate practically any metallic or non-metallic material that can be obtained in coils, sheets or plates . . . from foil-thin to 1" thick.

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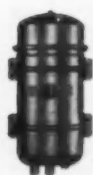
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**THERE'S A LUBER-FINER MODEL
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**LUBER-FINER PACKS
AVAILABLE**

1. REFINING PACK

Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPACK

First made available in 1941, the DIESELPACK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPACK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!

The DIESELPACK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

IT PAYS TO GET THE BEST!

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SINCE 1936**

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.

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points and pulling tractor hitch assembly to the right.

Centrifugal Pumps

In "Development and Application of Centrifugal Pumps for Die-Casting Service," Thomas E. Hall, Borg-Warner Corp., discussed the use of such pumps for die casting hydraulic systems, using water as the fluid with the addition of one part soluble oil in fifty to improve lubricity. A centrifugal pump, preferably with central source of supply, has the following advantages: a reasonable shutoff head or peak pressure is established without requiring relief valves; pulsations are reduced to a minimum; and the pump can be operated at shutoff for sufficient time to allow the die castings to set.

A battery of centrifugal pumps, properly installed, can adjust to extreme changes in load without materially changing the pressure to the casting machines. Water with a little oil is an ideal pumping medium.

...

Study Predicts Shortage Of Engineers Until 1960

A substantial shortage of college-trained engineers will continue to hamper vital sectors of American industry until 1960—and possibly for several years thereafter unless industry and educational leaders take preventive steps now.

This is the conclusion of a comprehensive survey, "The Supply and Demand of Engineers—1950-1960," made by Deutsch & Shea, Inc., technical manpower consultants, and published by Industrial Relation News.

The demand for engineers during the period 1950-57 was in excess of 46,000 a year, the survey reports, but with the expansion of industrial employment in general and research and development programs in particular, the annual demand for engineers from 1957 to 1960 will be even greater. During the first period, there were only 33,600 annual additions of college graduates to the engineering profession. That number will increase to 41,500 annually for the coming three years but even that will fall short of the average annual demand.

Mechanical and electrical engineers capable of working in such relatively new fields as electronics, rockets and missiles will remain in great demand during the next three years.

COLD HEADED FASTENERS COST LESS

**and usually give
better performance**

The designer need not be restricted to standard fastener sizes when they do not meet the requirements of his application. It is often much less expensive to specify a rivet, nail, screw, pin or stud to meet the task exactly as the application requires, than it is to compromise its function for the sake of "standards." In this regard, we offer the equally important advantages of flexibility according to our customers' design changes and production by high speed, quantity techniques. While there is nothing mysterious about the cold heading process, experience has proved it to be of inestimable value for getting maximum quality and output at a minimum cost. While the really spectacular advantages in cost show up in runs of several thousand pieces, we are also able to take care of your short run requirements. We welcome and expect manufacturers to come to us for advice and assistance concerning their fastener problems.

Given complete specifications, including a drawing and an idea of the application, we can quickly tell you whether or not it will be advantageous to have your fastener or part JOB-DESIGNED by HASSALL. The remaining important aspect of our service to you is the ability to get into production quickly and make prompt shipment.

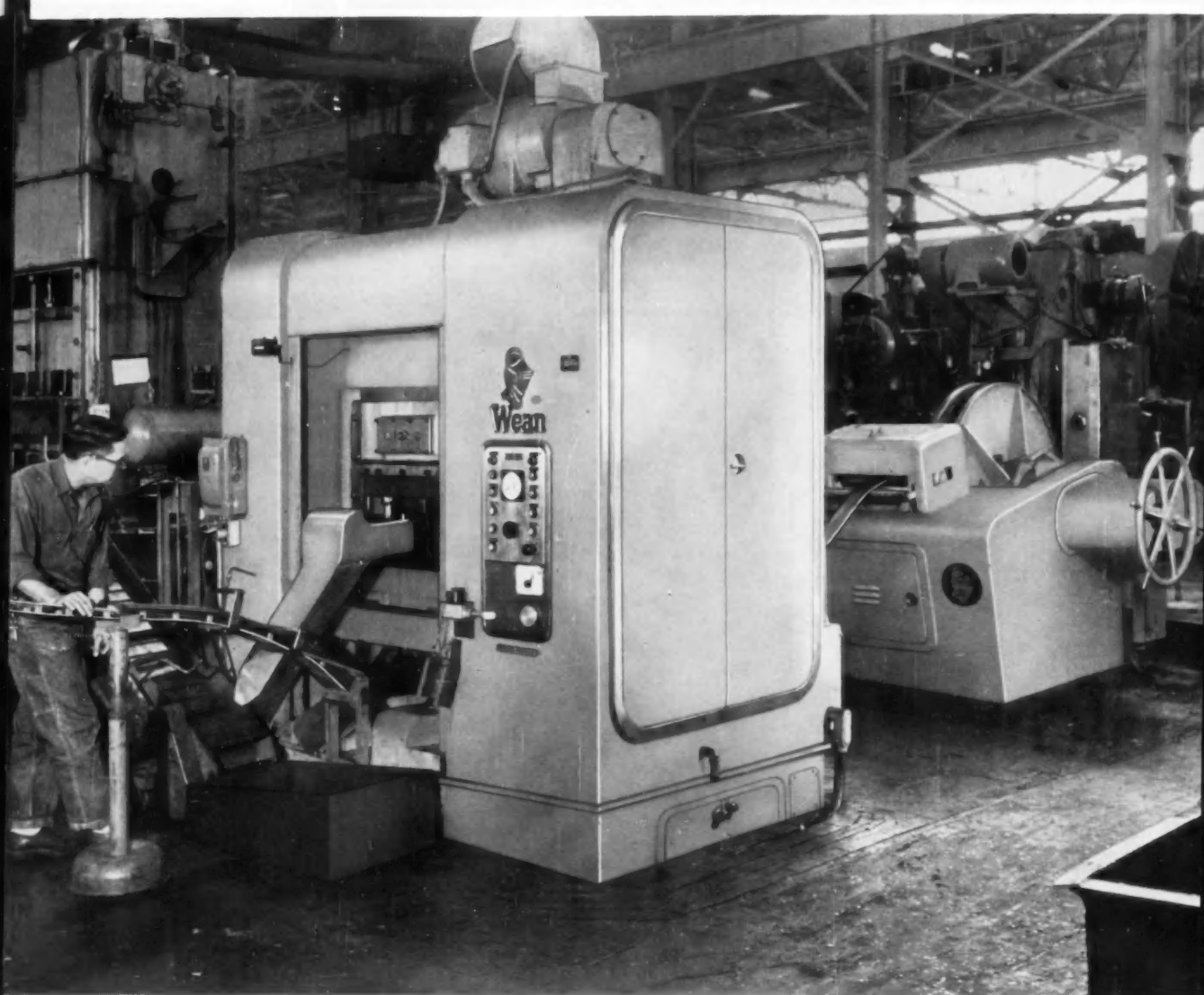
Write for a copy of our new booklet, "What the Designer Should Know about Cold Heading."

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Westbury, Long Island, N. Y.

Manufacturers Since 1850



One Wean "Flying Press"
replaces two
conventional
presses

THE 100 x 24 x 36 WEAN FLYING-PRESS, above, is turning out transmission vanes in the plant of a major automobile manufacturer. The vanes, $3\frac{3}{4}$ " long by $1\frac{5}{8}$ " wide, are blanked out of .042" steel strip and formed through a seven stage die. Previously produced by two conventional presses, each operating at 154 S.P.M., their combined production will be more than equaled by this single Wean Flying-Press operating at 350 S.P.M. Typical of the specialized engineering which Wean applies in "tailoring" press and auxiliary units to a specific operation is the ingenious mechanism which receives the vanes from the press and nest-stacks them for

maximum ease of handling.

But here is the important fact to cost conscious manufacturers . . . this Wean Flying-Press will materially reduce production costs: since only half the number of press units are now required for this operation, operating and maintenance costs are cut by more than 50%—supervision and handling requirements are proportionately reduced—and, less production space is required.

In addition to increased production rates, the Flying-Press incorporates many other cost saving advantages, too. But get the complete story by writing today for your copy of the Wean Flying-Press brochure.



Equipment Corporation

CLEVELAND 17, OHIO



NOW—a truck governor that regulates road speed—not engine speed

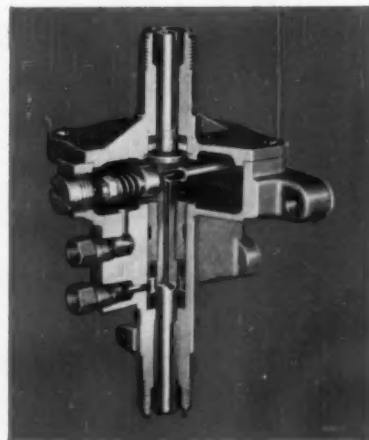
For the first time, truck fleet operators can get accurate, predetermined economy results with all trucks by having all trucks operate at road speeds which have proven most economical. The new Holley roadspeed governor is driven relative to rear wheel speed instead of relative to engine speed. It can easily be calibrated for any truck gear ratio and has been successfully tested over thousands of miles of road conditions.

The Holley roadspeed governor can be used in conjunction with the engine speed governor. Thus, if the vehicle is running in one of the lower gears and the engine reaches its governed speed

before reaching the predetermined mile per hour setting, the engine speed governor controls. In the event that road speed is reached prior to the engine rpm maximum setting, as in high gear, the roadspeed governor controls.

The roadspeed governor offers fleet operators a complete governing system designed to allow maximum horsepower under extreme load conditions and yet providing pinpoint control of road speed for maximum economy.

For more information on the Holley roadspeed governor, simply send a request on your letterhead.



The new Holley road speed governor, engineered to regulate actual road speed, is designed to eliminate mechanical trouble and prevent malfunctioning.

*For more than half-a-century
original equipment manufacturers
for the automotive industry.*

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T-8

11955 E. NINE MILE ROAD • WARREN, MICHIGAN

assistant

material consistency are important weight penalty items.

**Automotive Safety Foundation
Marks Its 20th Anniversary**

SAE National Aeronautic Meeting

(Continued from page 87)

strength to weight ratios at elevated temperatures. These new materials have physical properties which affect detail fabrication techniques. This is true of the new titanium alloys and stainless steels.

During the past few years, the airframe manufacturers have been developing various new methods for using these so-called thermal resistant materials. Creep forming is one of these new methods developed primarily to eliminate irregularities in the forming of titanium alloy sheet metal details. H. W. Bloom, tool engineer, North American Aviation, Inc., described in detail how his company tools up for it.

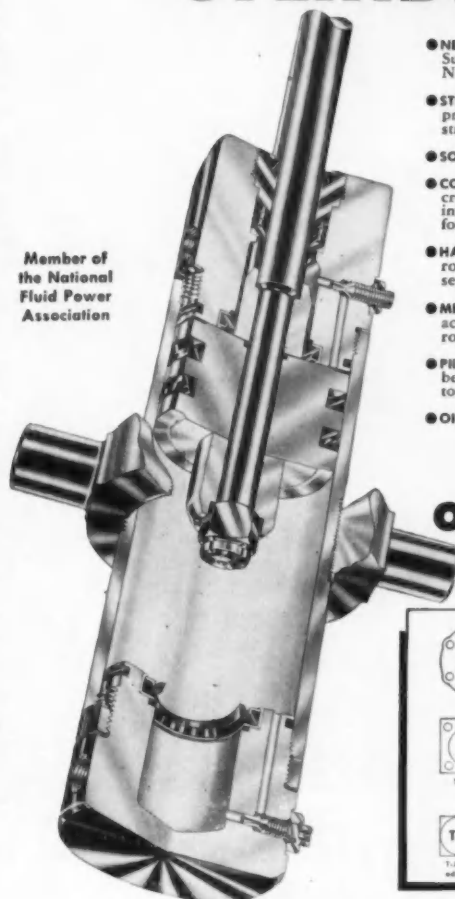
Creep forming is based on four variables: time, temperature, pressure, and elongation as in stretch forming or relaxation as in hot sizing. The methods and degree of applying these factors are strictly a matter of choice. But creep forming can be used to produce parts with a good degree of accuracy in materials which are considered by their own nature to be thermal resistant.

Increase in operational speeds demanded in modern aircraft and guided missiles causes a serious problem of materials selection for structural components. The problem arises as a result of the heat generated by air friction at ultra high speeds and by increased engine temperatures.

J. W. Price, production design engineer, Douglas Aircraft Co., talked about engineering requirements for a high temperature material. Engineers must consider strength-weight ratio, availability, reliability, cost, and producibility.

Also, they must consider "use" requirements. They must provide techniques and configurations by which they can adapt the material to the use intended for it. Tolerances, sheet sizes, and better

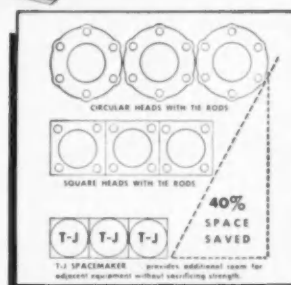
all the EXTRAS are standard with **T-J** *Spacemaker* **CYLINDERS**



Member of
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- **NEW** exclusive ingenious cushion designs... Super Cushion Flexible Seals for Air... New Self-Aligning Master Cushion for Oil.
- **STRONGER** than outmoded tie rod design, proven through actual tests. No tie rods to stretch.
- **SOLID STEEL HEADS** throughout the full line.
- **COMPACT DESIGN** eliminates tie rods, increasing the strength and reducing mounting space required, providing extra room for adjacent equipment.
- **HARD CHROME PLATED** body bores and piston rods... assure you of long trouble-free service. (Standard at no extra cost.)
- **METALLIC ROD SCRAPER**, not just a wiper, actually removes foreign matter from the rod.
- **PILOTTED PACKING GLAND** with extra long bearing. Additional strength and support to the piston rod.
- **OIL** pressure to 750 p.s.i. AIR to 200 p.s.i.

DELIVERY OFF THE SHELF!



You save 40% space when you switch from outmoded tie rod cylinders to the T-J Spacemaker! It's stronger, too! Fits right into automation programs in countless plants. Delivers top performance

and dependability with a big *plus* in advanced features. Wide range of styles, capacities... reduces man-hours and costs in all kinds of push-pull-lift jobs. Off-shelf delivery in 64,000 combinations!



NEW LITERATURE—Send today for new Catalog SM56 with complete engineering details on Spacemaker line. Write The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
HYDRAULIC AND PNEUMATIC CYLINDERS, CUTTERS, CLAMPERS

assistant ENGINEER available

His name is STANPAT, and though he is not human he can swallow up your tedious re-drawing and re-lettering of standard and repetitive blueprint items for 24 hours a day if need be—without tiring. STANPAT is the remarkable tri-acetate sheet that is pre-printed with your specification and revision boxes, standard symbols, sub-assemblies, components and cross-sections . . . with adhesive front or back, waiting to be pressed into position in 15 seconds! Reproductions are unusually crisp and clear, guaranteed not to wrinkle, dry out or come off. STANPAT saves hundreds of hours in drafting time and money, allowing the engineer more time for creative work.

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**so simple
1 to use:**
PEEL the tri-acetate adhesive from its backing.



2 PLACE the tri-acetate in position on the tracing.



3 PRESS into position, will not wrinkle or come off.



STANPAT CO., Whitestone 57, N. Y., U. S. A.
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Title _____
Company _____
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material consistency are important weight penalty items.

Today, the tremendous increase in available power provides the engineer with the possibility of almost unlimited speed. But material capabilities do limit that speed. The future should see a steady improvement in material capability and continual increase in the strength-weight ratio of alloys.

Materials which now are laboratory curiosities will become well-known useful tools when we can better understand what they can do, Mr. Price said.

The SAE Manly Award went this year to W. A. Benser and H. B. Finger, Lewis Flight Propulsion Lab, National Advisory Committee for Aeronautics. The award goes to the best paper presented at an SAE meeting during the year on theory or practice in the design and construction of powerplants.

This year's Aircraft Engineering Display—107 exhibitors of aircraft gear—was one of the finest ever held on the West Coast.

Automotive Safety Foundation Marks Its 20th Anniversary


The Automotive Safety Foundation, in observing its 20th anniversary Nov. 7, cited the encouraging fact that since 1937, the automobile accident fatality rate has been reduced from 14.7 deaths per 100 million vehicle miles to 6, a drop of more than 60 per cent. The foundation marked its anniversary with a dinner in Detroit for public officials, business and civic leaders from all parts of the country.

Buick Suggests List Prices For German-Made Opel Rekord

Buick Div. has announced suggested port-of-entry list prices for the Opel Rekord, German-made small car being sold in this country by Buick dealers. The two-door sedan ranges from \$1812.50 at New York to \$1994.64 at San Francisco.

Buick's initial import schedule is 1000 Opels a month, but only the Rekord is being shipped until December, when imports of the two-door station wagon Caravan will begin. East coast dealers received the early Rekord shipments.

**AUTOMOTIVE
INDUSTRIES
Goes into
Leading
Plants in the
Automotive
and Aircraft
Industries**



**Order
Eaton Caps
and Filler Necks
from Stock**

SAVE TIME . . . SAVE MONEY

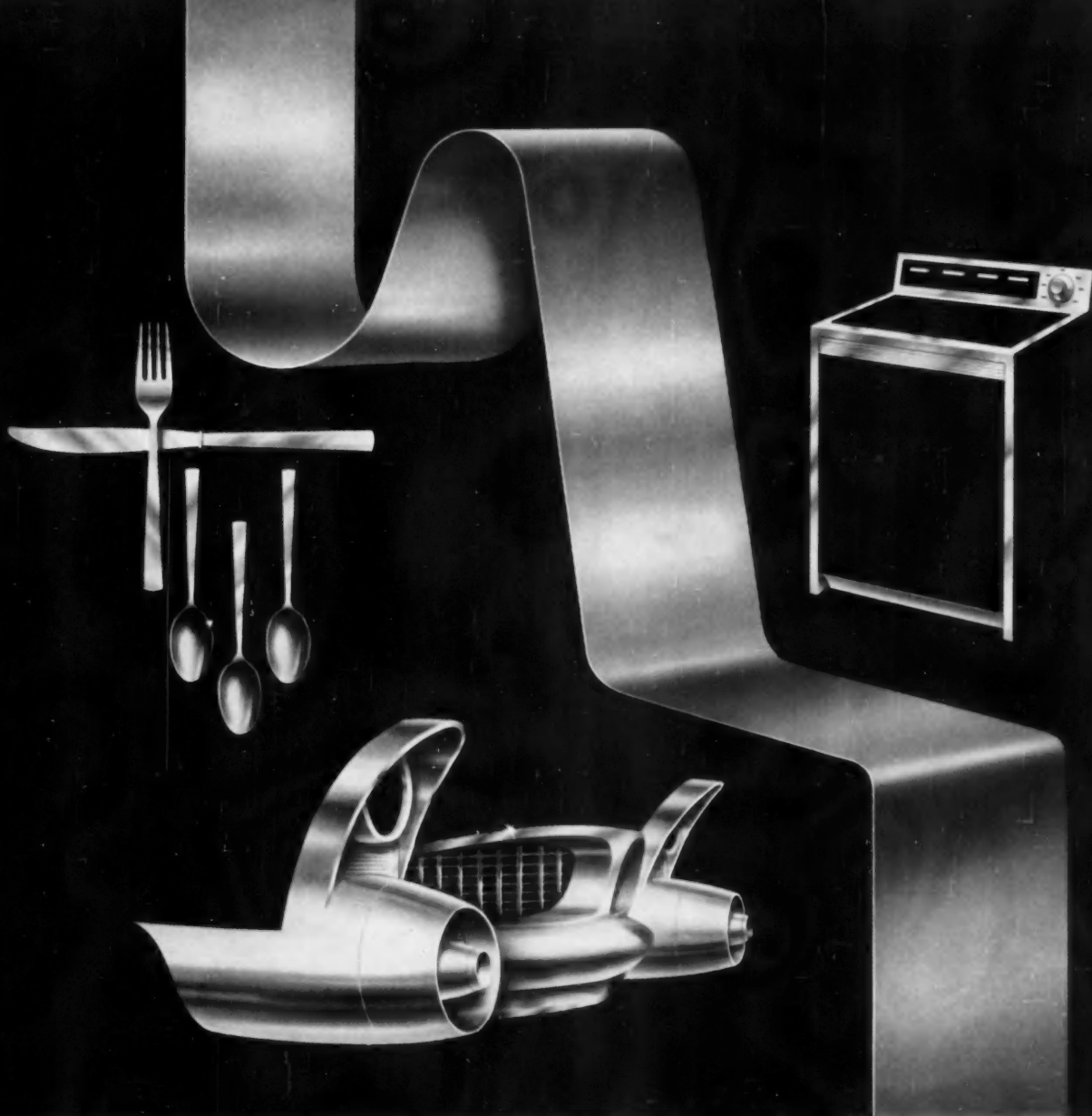
Eaton offers immediate delivery on caps and filler necks now in production. Available types include fuel tank caps, oil filler caps, radiator caps (both standard and pressurized system types), and suitable closures for sheet metal tanks in every field of service. Enjoy the cost advantages of high volume production, plus the time-saving benefits of purchasing thoroughly tested, well engineered caps and filler necks from stock. Send for illustrated folder with specifications covering Eaton's complete line of standard caps and filler necks.



**Radiator and Fuel Tank Pressure
Relief Caps and Valves a Specialty**

EATON MANUFACTURING COMPANY

STAMPING DIVISION • 17877 St. Clair Avenue • Cleveland 10, Ohio



CALL CRUCIBLE FOR UNIFORM-QUALITY STAINLESS STRIP

Crucible offers you dependable, fast delivery of stainless strip in every standard grade—precision-rolled to your specifications. Every coil comes to you with a finish that is unsurpassed . . . and with uniform quality that ensures easy workability.

Remember: You always get the most dependable quality and service from Crucible because Crucible's operations are fully integrated from raw material to delivery to you. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.





ALL THAT THE NAME IMPLIES—
AT THE TOP—IN DESIGN AND IN DEPENDABILITY

Do you need a reliable carburetor to meet your specialized requirements? Then Zenith* Carburetor is your answer. We either have built or have the skills to build the carburetor you want—at low cost.

Our many contributions in every phase of carburetor research and development are your assurance of satisfaction. **Zenith actually has more experience in more fields with more engine types than any other carburetor manufacturer!**

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696 HART AVE., DETROIT 14, MICH.



Hammer or Progg





**Roebling
Tire Bead Wire:
Packaged for
Maximum Benefit**

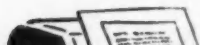
The problems eliminated by this unique reel-less core packaging system are manifold. Loads are palletized two cores per pallet and may be stacked two or three high. This, plus the fact that

you need not accumulate empty reels means storage space requirements are cut to *less than half*. You do away with all freight and handling costs on reels, the bother and expense of "bookkeeping" returnable reels, and the freezing of money in reel deposits.

This is typical of Roebling's advanced packaging methods—that makes handling Roebling high-quality wire so

much easier. For details on this efficient Roebling Tire Bead Wire packaging method, or information on other types of Roebling wire, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



is letting it be known that it has no present intention of easing its

more are going to be hired. This is in accordance with "Parkinson's



Hammer or Press.....

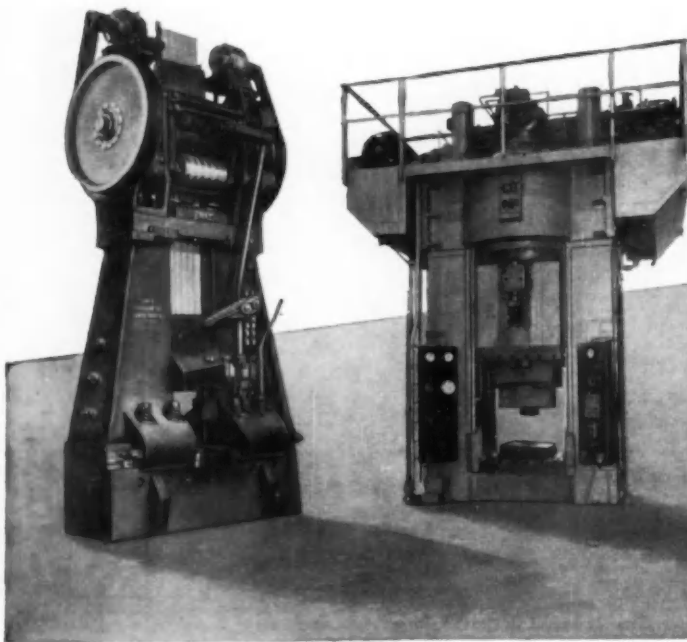


which is best for your forged product?

Hammers forge some pieces more efficiently than presses; presses work some forgings better than hammers. What is a forging man to do? Easy! Talk with the firm that makes the best in both hammers and presses . . . talk with Erie Foundry Company. We will help you with expert specific advice on the right machine for your forging requirements.

In one instance, Eaton Manufacturing Company's (Marion, Ohio) forge plant decided on this Erie 10,000-lb. Board Drop Hammer to forge 68-lb net flat-back ring gears, 16" in diameter—in a single impression die, straight down, without blocking or pancaking. And, in another instance, Kaiser Aluminum's (Erie, Pa.) forge plant decided to use this Erie Foundry Hydraulic Forging Press with electromagnetic controls, to produce in quantity, their no-draft forgings.

Which is best for you—hammer or press? Talk to the recognized leader . . . Erie Foundry Co. Just call or write.



ERIE FOUNDRY CO. ERIE 5, PA.

World's Greatest Name in Forging Machines—Since 1895



Long-range mobilization planning is about to undergo another subtle but basic change in direction. There is a growing feeling in inner circles of the government that the lightning-fast devastation of rocket warfare has already made obsolete many time-honored concepts about the "importance" of armor-plate, manned aircraft, army tanks, and battle-ships. And defense planners are becoming increasingly uneasy over the high cost of maintaining the inventories of end-products they now have in storage for use in the event of all-out mobilization.

The \$38-billion ceiling on defense spending that was imposed last summer by former Defense Secretary Wilson is now obsolete. What's in the making now is a modest increase of up to \$2 billion in this year's total defense budget.

The White House is thinking about asking Congress to allow income tax deductions on contributions to research and development. Belief around the White House is that such a tax break would greatly stimulate industrial interest in research, while not resulting in a significant drop in federal revenue.

Business and Defense Services Administration—the Federal Government's advice-for-industry office—is undergoing a major shakeup and will emerge under a new title late this year. Present title is not sufficiently descriptive to those outside Washington, Dept. of Commerce officials admit.

Despite the undercurrent of industrial concern over slumping sales, the Federal Reserve Board

is letting it be known that it has no present intention of easing its tight money policy. The Board takes the position that inflation—not a recession—is the real and continuing economic threat for the long pull.

This country's foreign aid program has been cut almost in half in the last four years, but more workers than ever are on the payroll to administer the program and

more are going to be hired. This is in accordance with "Parkinson's Law" as enunciated by British Professor C. N. Parkinson. This law states that bureaucracy tends to increase itself at a constant rate each year, regardless of whether or not the bureaucrats have the same amount of work or less to do. They make work for one another, thereby increasing the volume of activity but not the volume of production.

**Slotting
3000
Key Blanks
PER
HOUR**

... another example of
Davis & Thompson Production Engineering

If you need high production in milling, drilling, boring and similar metalworking operations ... with a minimum of equipment and capital expenditure, call in a Davis and Thompson Representative.

This key blank slotting machine is only one of countless machining problems solved by D & T Engineers.

Space does not permit describing this machine in full detail, but if you would like complete details, write.

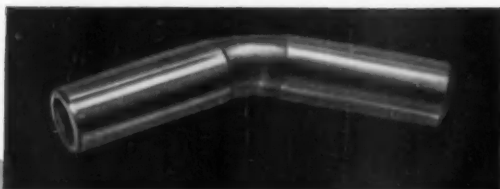
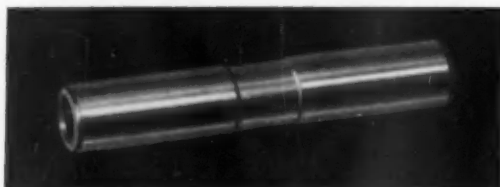
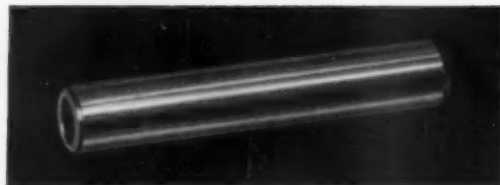


ADDITIONAL INFORMATION

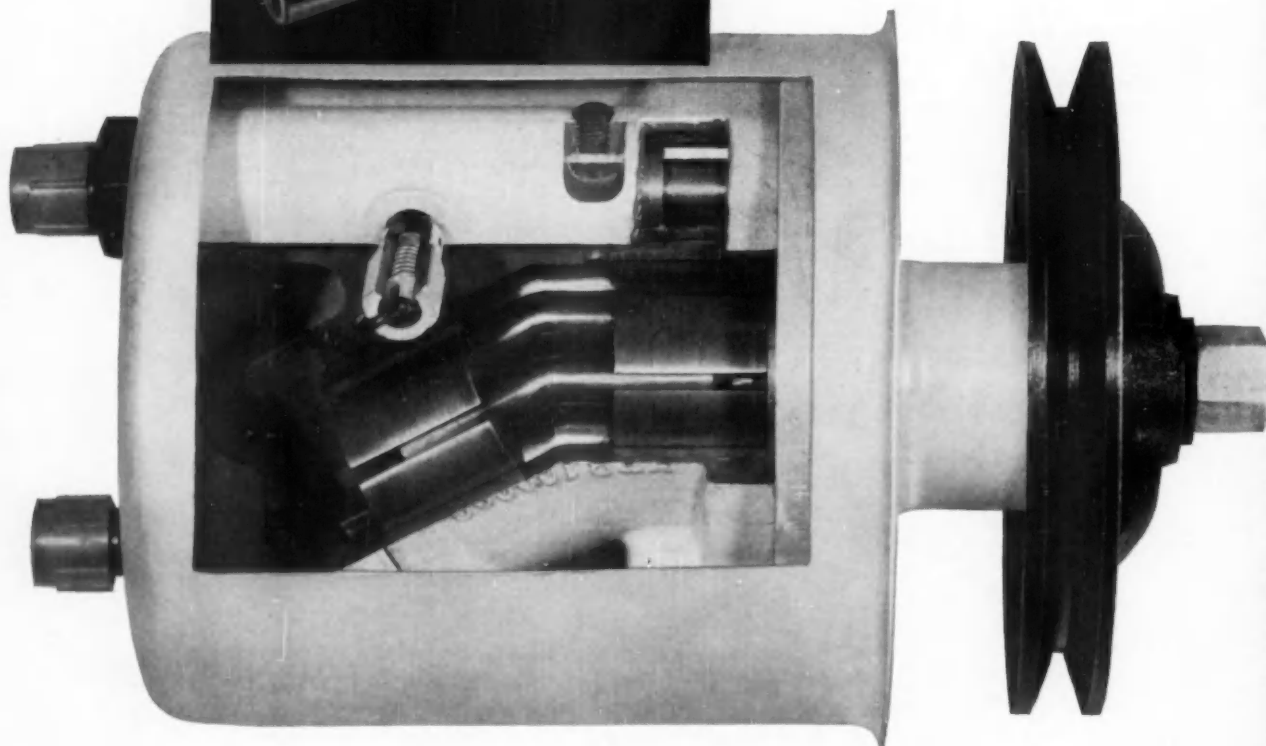
Get the complete story of the facilities available from Davis and Thompson. Write for this 8-page bulletin today. Ask for Bulletin 1002.

Davis and Thompson Co.
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Republic



Unusual ductility and uniformity of Republic ELECTRUNIT Mechanical Tubing makes possible the assembly of this automotive hydraulic power pump, designed and assembled by Thompson Products, Inc. Finished O.D. is to $\pm .0003$ inches.



REPUBLIC



World's Widest Range of Standard Steels

ELECTRUNITE Mechanical Tubing

meets all close tolerance requirements
for new Thompson Products Automotive Pump!

Close tolerance, uniformity, ductility, workability — four important performance requirements, all reasons why Republic ELECTRUNITE Mechanical Tubing is used in a new automotive hydraulic power pump assembly.

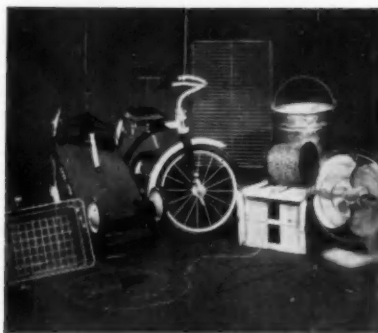
Designed and assembled by Thompson Products, Inc., Cleveland, Ohio, this pump furnishes power for power steering featured by a nationally famous automobile manufacturer.

Will-O-Hill Industries, Inc., Willoughby, Ohio, subcontractor, manufacturers, and specialists in close tolerance tubular stampings, cut $\frac{7}{16}$ -inch-diameter Republic ELECTRUNITE Mechanical Tubing into units $2\frac{3}{16}$ inches long. Each unit is rolled

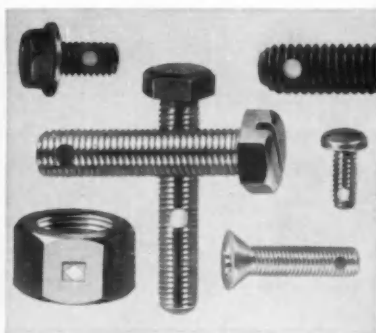
to form a slight groove in the center, and bent to an angle of exactly 150° . Nine such pieces are used in each pump assembly.

Both ends are subsequently bent in a die, held to a tolerance of $\pm .0005$ inches and finished with an O.D. to $\pm .0003$ inches. This close tolerance represents outstanding workability, using manufactured tubing as base stock.

This is another example of how Republic engineers are able to work with you in solving precision problems and reducing costs through the unusual uniformity and ductility of Republic ELECTRUNITE Mechanical Tubing. For additional information, send coupon or write today!



UNIFORM ROUNDNESS AND SURFACE FINISH are reasons why Republic Manufacturers Wire is specified for the most difficult fabrication requirements. Up-to-date machinery and methods, skilled laboratory control, and careful inspection, assure every purchaser of a material that will suit his specific needs. Manufacturers producing a wide variety of items have found Republic Wire a valuable aid in minimizing losses, stepping up production, and increasing the salability of their products. Mail coupon for complete details.



MEET SEVERE REQUIREMENTS for maximum holding power with Republic Nylok Bolts and Nuts, specifically designed for bolted assemblies that must be vibration-proof and adjustable. Resilient nylon insert permanently embedded in the fastener provides re-usability, eliminates lost motion of assembling extra locking devices. Nylok Bolts and Nuts can be either hand or power wrenches. Republic offers manufacturers more than 20,000 standard and 8,000 special types and sizes of fasteners to meet practically any fabrication-assembly.



GREATER MACHINABILITY, better surface finish, higher strength, are a few of the over-all economies of using Republic Cold Finished Steel Bars for machine parts. This high-accuracy .22-caliber target pistol, made by the High Standard Manufacturing Corporation, Hamden, Connecticut, represents the ultimate in target pistol performance, winning honors in championship matches throughout the world. Republic Cold Finished Steel Bars, used for barrel stock in this pistol and other High Standard firearms, meet their most exacting specifications.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION

DEPT. C-4344

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Please send me the following information:

- ☐ Republic ELECTRUNITE® Mechanical Tubing
- ☐ Republic Cold Finished Steel Bars
- ☐ Republic Nylok® Bolts and Nuts
- ☐ Republic Manufacturers Wire

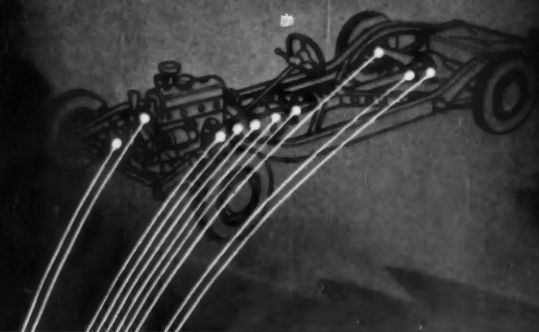
Name _____ Title _____

Company _____

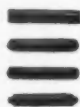
Address _____

City _____ Zone _____ State _____

Oldest in age
Still in
the lead



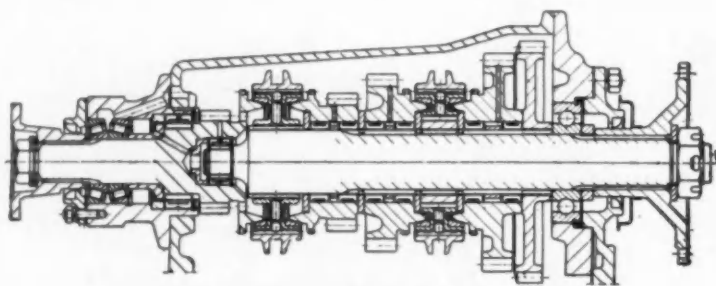
loose needles



needle cartridges



complete bearings

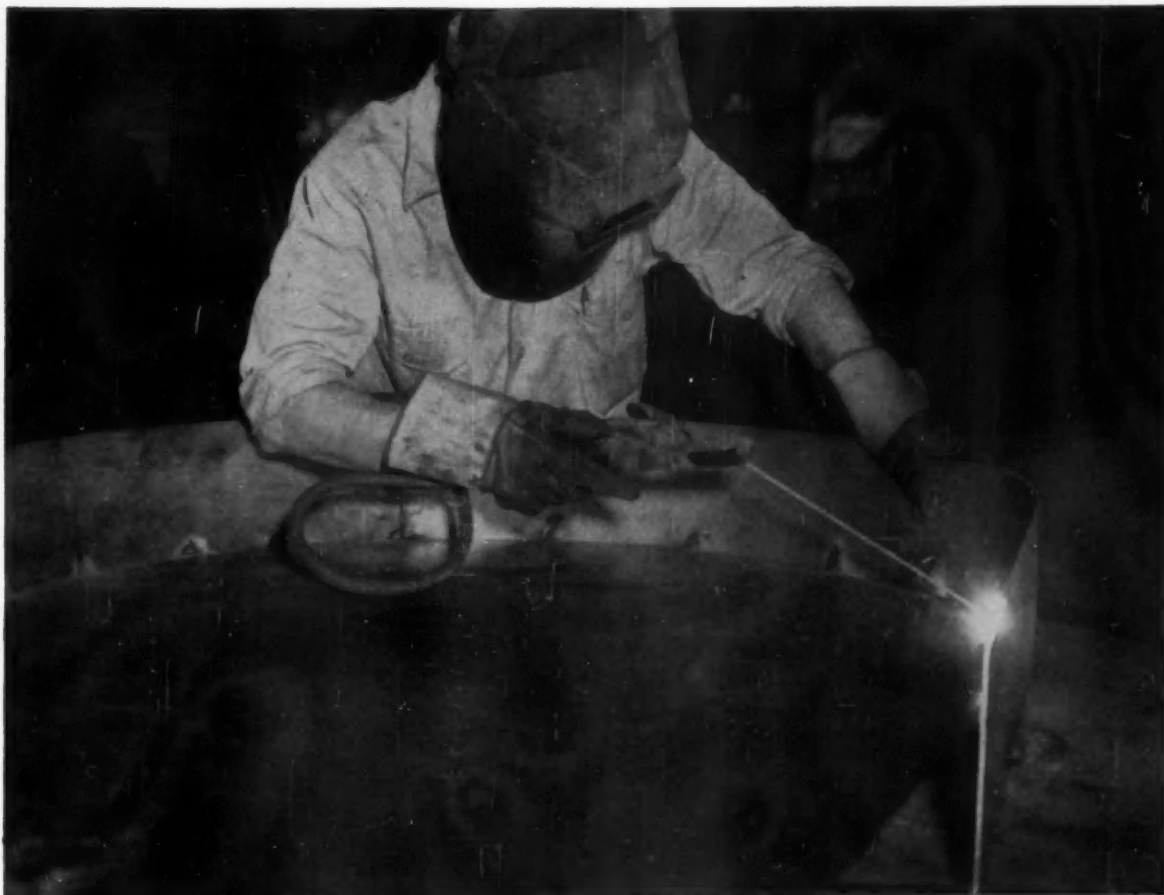


GEAR BOX FOR TRUCKS



NADELLA
NEEDLE BEARINGS

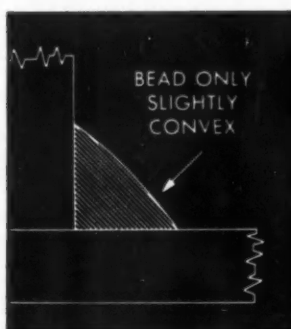
133 à 137 BOUL. NATIONAL - RUEIL-MALMAISON (S.-&-O.) FRANCE



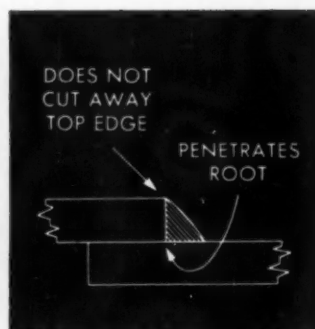
FOR HIGH-SPEED PRODUCTION OF LAP AND FILLET WELDS FLEETWELD 72 (E-6012 ELECTRODE)

- gives high melt-off
- operates over wider current range without overheating
- has slightly convex bead
- penetrates root well
- does not cut away top edge

Write for
MILD STEEL WELDDIRECTORY
SB-1351



Greater mileage comes from near flat bead with Fleetweld 72.



Increased speed because weld flows up to catch top edge without excess pile up or cutting away top edge.

THE LINCOLN ELECTRIC COMPANY

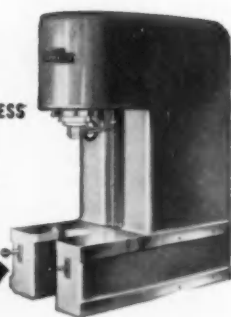
Dept. 1006, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

2 to 8 TON CAPACITY MULTIPRESS

Series F Bench model

- 18" daylight—12" stroke
- Closing speeds up to 1450 ipm
- Pressing speeds up to 570 ipm
- Return speeds up to 920 ipm



1-TON CAPACITY MULTIPRESS

Series A Bench model

- 8" daylight—3" stroke
- Operating cycles per minute (based on 1" stroke)—150

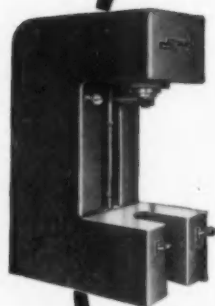


Money Saving Methods

FOR ASSEMBLING - TRIMMING - BROACHING - PUNCHING
MARKING - BLANKING - DRAWING AND FORMING

Pick the press that suits your job best
...DENISON HydrOILic **MULTIPRESS**

...a thousand money-saving press combinations



5 and 10 TON CAPACITY MULTIPRESS

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- 24" daylight—12" stroke
- Closing speeds up to 760 ipm
- Pressing speeds up to 230 ipm
- Return speeds up to 330 ipm

Here's the most versatile line of presses today... a range of sizes and models that lets you choose the best combination for your work!

With Multipress, production is faster... quality more uniform... methods simpler—because fast, smooth hydraulic ram action duplicates identical pressure on every stroke. Touch control, vibratory ram action, and hydraulic interlock are available.

Pick from 10 frame sizes—1 to 75 ton capacity—with throat depths and daylight openings to suit your needs. Ram speeds up to 1300 inches-per-minute. Manual, servo or automatic controls on most models.

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DENISON ENGINEERING DIVISION

American Brake Shoe Co.

1212 Dublin Road, Columbus 16, Ohio

5 to 15 TON CAPACITY MULTIPRESS

Series H Floor model

- 23" daylight—12" stroke
- Closing speeds up to 820 ipm
- Pressing speeds up to 280 ipm
- Return speeds up to 500 ipm



25-TON CAPACITY MULTIPRESS

Series K Floor model

- 24" daylight—15" stroke
- Closing speeds up to 530 ipm
- Pressing speeds up to 250 ipm
- Return speeds up to 470 ipm

35-TON CAPACITY MULTIPRESS

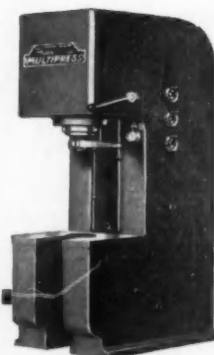
Series L Floor model

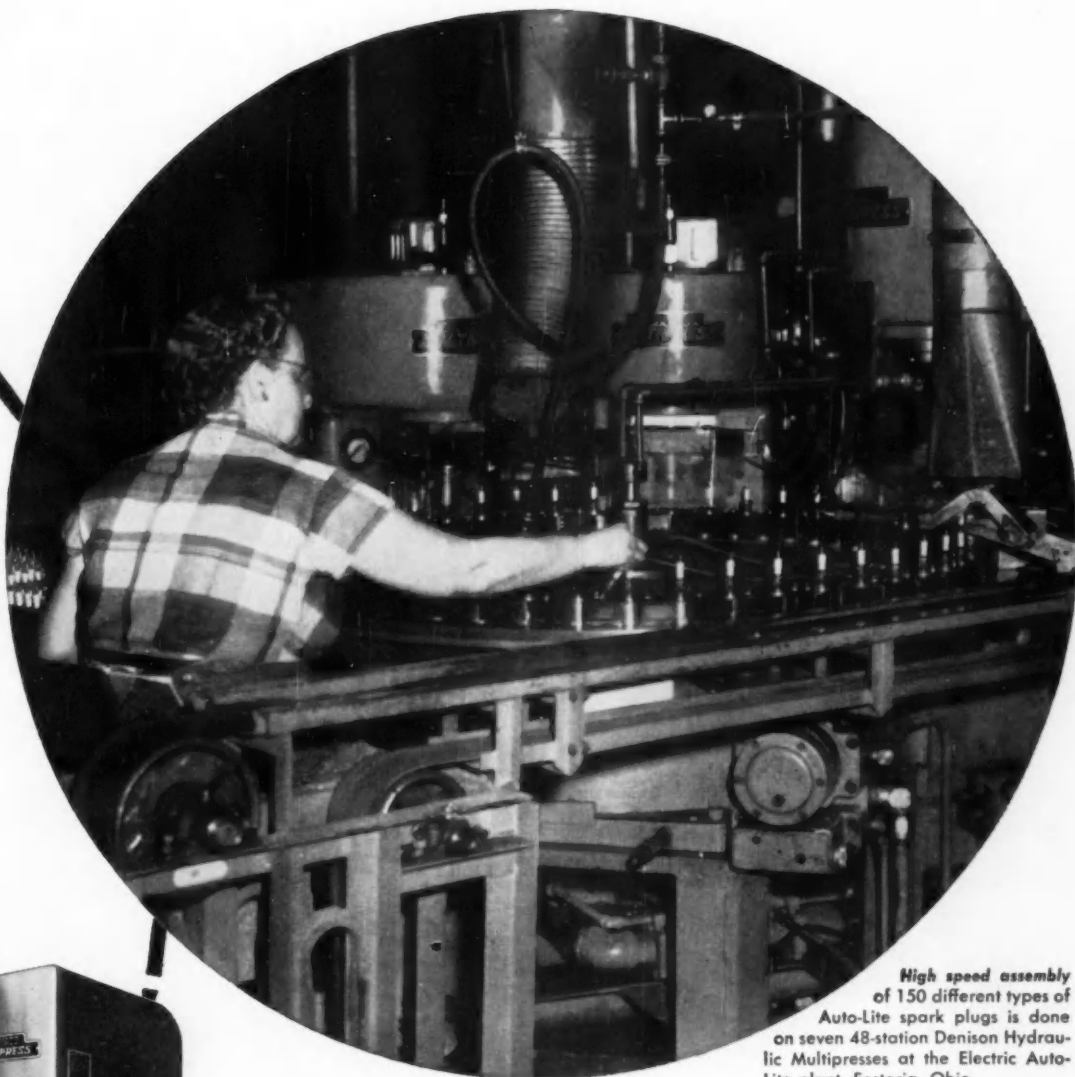
- 24" daylight—15" stroke
- Closing speeds up to 530 ipm
- Pressing speeds up to 250 ipm
- Return speeds up to 470 ipm

50-TON CAPACITY MULTIPRESS

Series N Floor model

- 24" daylight—15" stroke
- Closing speeds up to 290 ipm
- Pressing speeds up to 145 ipm
- Return speeds up to 290 ipm





High speed assembly of 150 different types of Auto-Lite spark plugs is done on seven 48-station Denison Hydraulic Multipresses at the Electric Auto-Lite plant, Fostoria, Ohio.



75-TON CAPACITY MULTIPRESS

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- 30" daylight—15" stroke
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- Pressing speeds up to 110 ipm
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American Brake Shoe Co.
1212 Dublin Road, Columbus 16, Ohio

Yes, please send me—at no cost or obligation—more information about the Denison Hydraulic Multipress applications checked below:

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|-------------------|---|------------------|---|
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<input type="checkbox"/> Marking
<input type="checkbox"/> Punching
<input type="checkbox"/> Trimming
<input type="checkbox"/> Broaching | Type of Material | <input type="checkbox"/> Steel
<input type="checkbox"/> Brass
<input type="checkbox"/> Aluminum
<input type="checkbox"/> Plastic
<input type="checkbox"/> Glass |
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Please have a salesman call ☐

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 City _____ Zone _____ State _____
 Your Name _____
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HOW CAN THE MULTIPRESS HELP YOU?

Use this handy form to get more information

DENISON
HydrOILics

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

**TWO GREAT NAMES
IN ORIGINAL EQUIPMENT...**

**build
powerful
customer
preference
to help sell
your products!**

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**WORLD LEADER IN LUBRICATION
EQUIPMENT**

Alemite is the originator of high pressure lubrication. It offers the most complete line — adopted as standard equipment throughout the world for automotive, farm and industrial use.

For further information, write
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Original Equipment Sales



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All types, including complete drive equipment
... designed, engineered and
manufactured to your specifications!



Speedometers

Most complete line of electric or mechanical speedometers, including 160 MPH type, both types approved for military applications. Heavy-duty construction for long life.



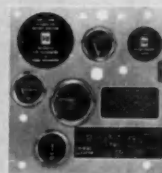
Electric 2-Speed Adapter

Automatically corrects speedometer reading when vehicle is operated with a 2-speed rear axle. Variable ratio design permits application on all makes.



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Only Stewart-Warner offers all types: Bimetal, Magnetic, Diaphragm, Bourdon Tube.



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Continuous, automatic protection for unattended engines. Automatically shuts off engine before oil pressure drops too low, or engine temperature rises too high.

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Complete instrument panels custom-built to your specifications. Stewart-Warner also manufactures flexible shafts, gears, adapters and other drive equipment—everything you need for complete application.

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Includes all types of hood catches, fasteners and brackets, handles.



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Spring-primed — handles all regular pressure gun greases. Positive delivery... up to 10,000 lbs. pressure. Armorhard fittings for every purpose.



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Automatic centralized lubrication. No limit to number of bearings served. For trucks, trailers, off-highway equipment and passenger cars.



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ORIGINAL EQUIPMENT SALES
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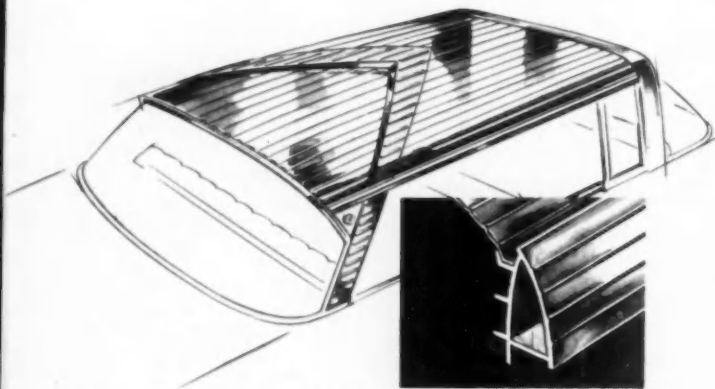
increase design versatility,
offer beauty plus economy



The Finest Products
Made with Aluminum

are made with

REYNOLDS  ALUMINUM



Extruded side rail with integral drip molding.

LOWER CAR DESIGNS are calling new attention to roof areas—and embossed clear and color anodized aluminum roof panels offer interesting possibilities from both sales and engineering standpoints. Here are some aluminum roof panel advantages to consider:

- Tremendous styling possibilities through integral bright finished emblems, moldings and other decorative effects.
- Design reinforcing latitudes through the use of embossing techniques.
- Reduced tooling costs through integral design.
- Increased design versatility using current fabricating techniques and equipment.
- Eye-catching, colorful beauty with the Reynolds Aluminum "gleam of gold" and "look of sterling" plus the beauty of aluminum's variety of embossed patterns.

Aluminum roof panels are another example of where the forward looking automotive industry is considering increased use of aluminum to cut costs, reduce weight, increase beauty, improve performance and add greater value in fine new cars.

To help you get the very most from the aluminum you use, Reynolds Aluminum Specialists will be glad to work with you on both present and future applications. For details on aluminum mill products and on fabricated aluminum parts and trim, call the Reynolds office listed under "Aluminum" in your classified telephone directory. Or write *Reynolds Metals Company, Fisher Building, Detroit 2, Michigan* or *P.O. Box 1800-MW, Louisville 1, Kentucky*.

NOTE: Before you buy any part—have it priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.

REYNOLDS ALUMINUM

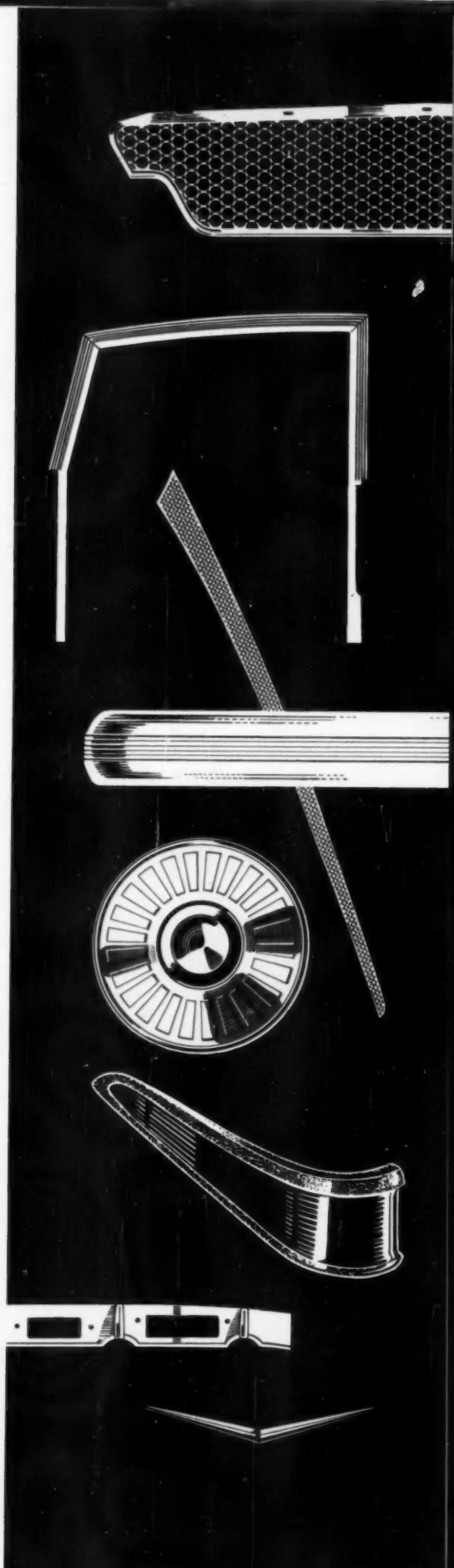
THE METAL FOR AUTOMATION
TRADE MARK

The Finest Products
Made with Aluminum

are made with

REYNOLDS  ALUMINUM

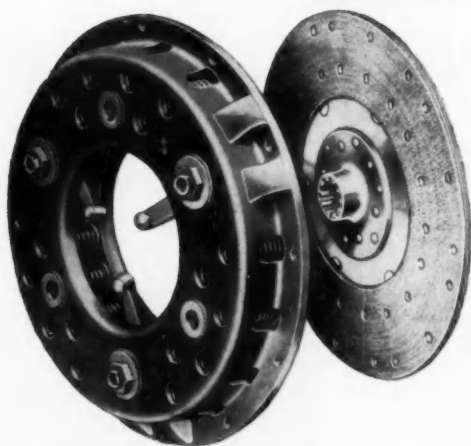
Watch Reynolds All-Family Television Program "DISNEYLAND", ABC-TV.





"We would not consider ordering new equipment without **this clutch**"

... says D. H. Stoddard
Equipment Superintendent
Arkansas Motor Freight Lines, Inc.



He's talking about the *Lipe* Heavy-Duty Direct Pressure Clutch

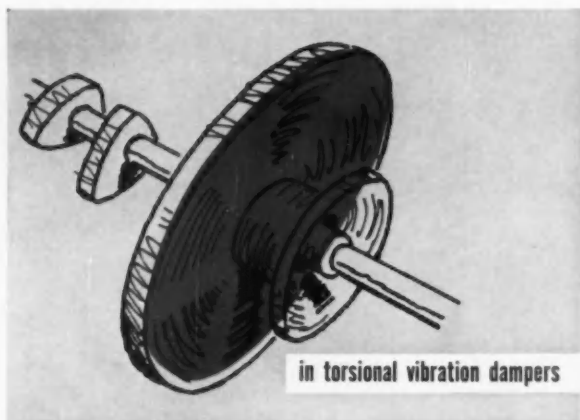
"Since July, 1955," says Mr. Stoddard, "we have some 100 more heavy units equipped with the Lipe Direct Pressure Clutches. Some sixty units were so equipped as original specifications, with the remainder being change-overs from other makes and types of clutches."

"We are at present taking delivery of the first of 122 Model DF869 Diesels, all equipped with the DP clutch. From our past experience, we would not consider ordering new equipment without specifying this clutch. We operate some 1,500,000 miles per month, and . . . we have not had one wear out or burn out."

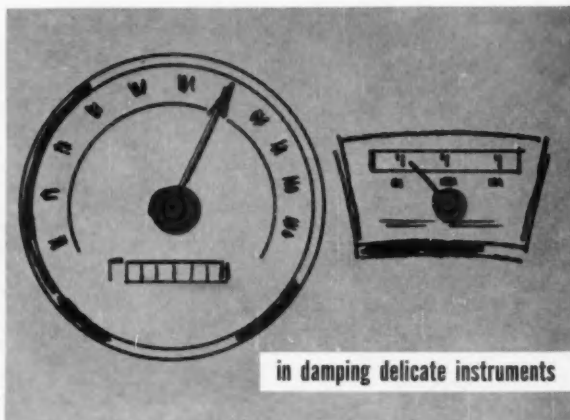
If you would like trouble-free clutch performance like that of Arkansas Motor Freight in your vehicles . . . write today for complete details on the Lipe DP Clutch . . . now available in five sizes for engines developing from 300 to 1300 ft-lb of torque.



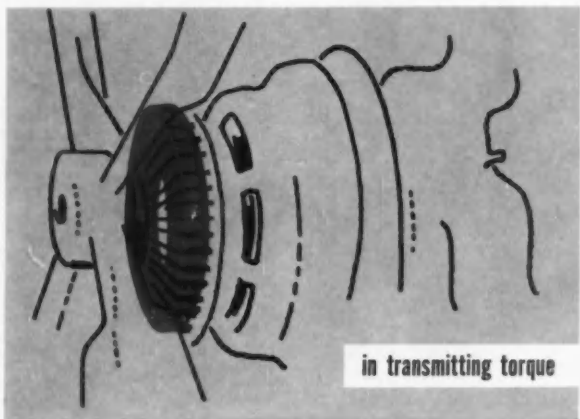
MANUFACTURERS OF AUTOMOTIVE CLUTCHES & MACHINE TOOLS



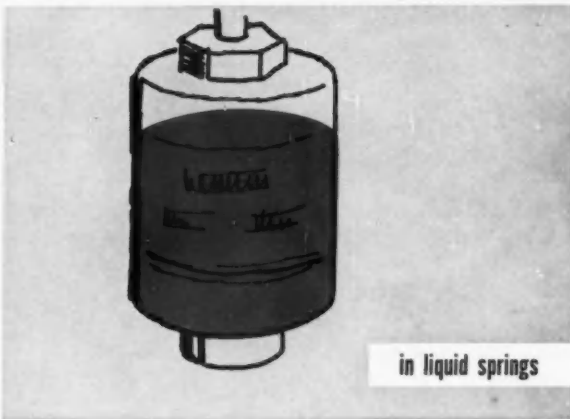
in torsional vibration dampers



in damping delicate instruments



in transmitting torque



in liquid springs

Silicone Fluids ASSURE UNIFORM PERFORMANCE DESPITE HEAT OR COLD

Dow Corning silicone fluids retain near-constant viscosity over a wide temperature span. Their effectiveness as damping media or coupling fluids is unimpaired by heat or cold . . . also true of their use in liquid springs. Silicone fluids are already helping automotive designers get better performance in such parts as those shown . . . future uses are almost limitless. Consider the unusual properties of these materials:

FOR DAMPING OR COUPLING Dow Corning silicone fluids offer serviceability from -130 to 400 F. Available in many viscosities, they show little change in damping or torque transmitting properties despite varying temperatures. These fluids are highly resistant to oxidation and to

viscosity breakdown due to shear. As a result, they give very long service without replacement.

FOR LIQUID SPRINGS Dow Corning silicone fluids combine a high degree of compressibility, low coefficient of expansion, and flat viscosity-temperature slope.

WRITE TODAY FOR MORE EXTENSIVE INFORMATION

DEPT. 0623



Dow Corning CORPORATION
MIDLAND, MICHIGAN

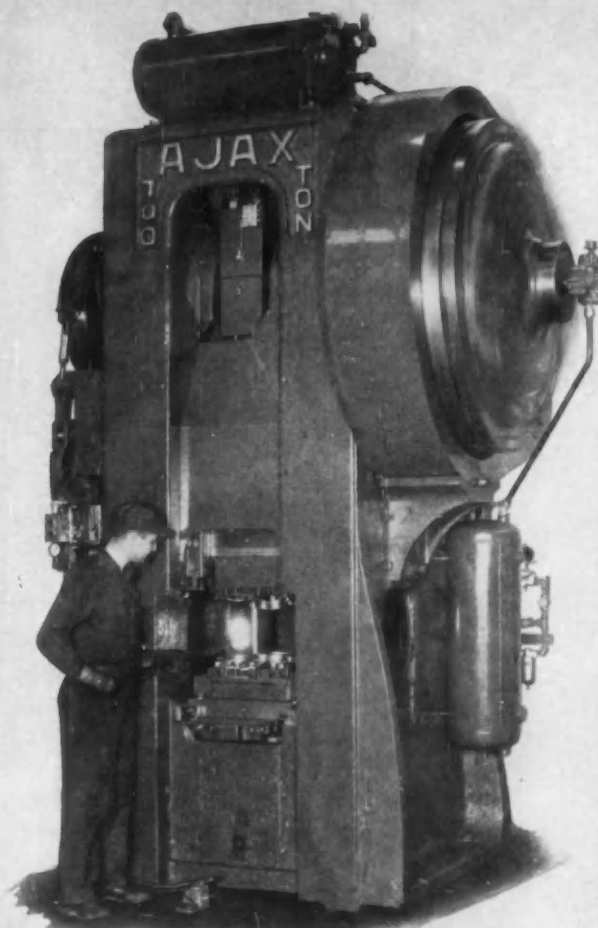
Forging Gear Blanks to Close Tolerances ... on AJAX *High Speed* Forging Presses

Pictured at the right is a 700 ton Ajax Forging Press in operation forging gear blanks at high speeds in one heat.

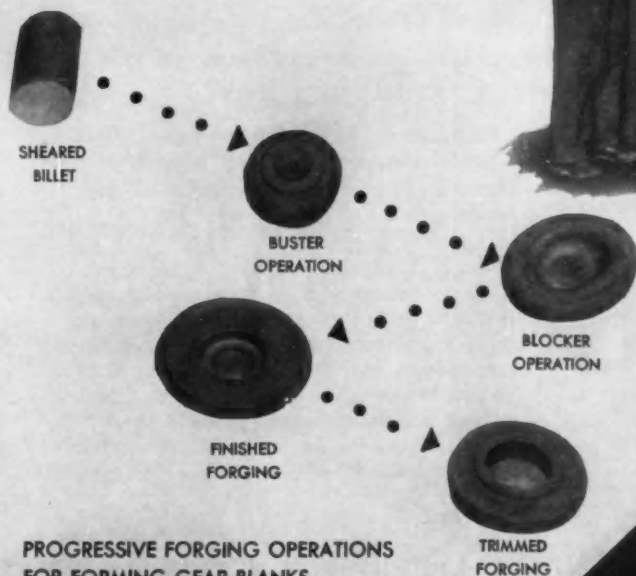
The progressive forging operations necessary for forming this blank are shown below.

These and other multi-stage forgings are forged economically to close tolerances with a minimum of flash in Ajax Presses at high rates of production.

For your forging needs Ajax designs and builds presses from 300 tons to 8000 tons capacity.



700 ton Ajax Forging Press in operation.



Write for Bulletin 75 C

THE
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MANUFACTURING
COMPANY

CLEVELAND 17, OHIO

110 S. DEARBORN ST., CHICAGO, ILL.

W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

*it's only part
of the HTM* story...*

FATIGUE RESISTANCE



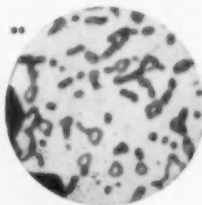
*Hi-Tensile (Heat-Treated) Malleable

**HTM metal, liquid quenched, x2000, etched

Perhaps your product takes a severe beating—like rocker arms, for instance. Then you're interested in fatigue resistance under elevated temperatures. And that's where HTM castings really score.

But HTM castings don't stop there. Other major advantages of HTM metal are high fluidity that casts easily into complicated shapes... high ultimate strength... excellent non-seizing properties... *machinability index* of 80-90 (B1112 steel = 100).

Look into the advantages of HTM metal. It can improve the service performance—and sales performance—of your product. AA-3090



NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

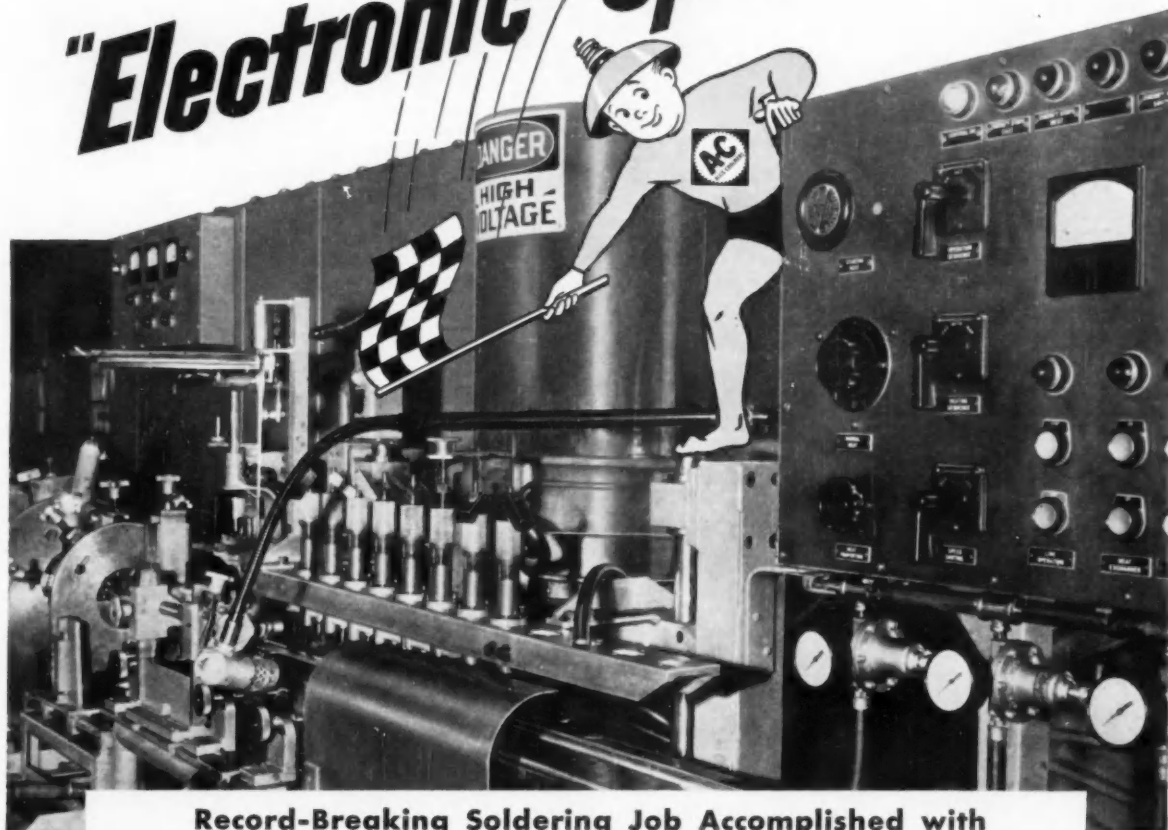
Established 1868

Cleveland 6, Ohio

The nation's largest independent producer of malleable and pearlitic malleable

WESTERN ELECTRIC
Sheathes Cable
with Metal Jacket on

"Electronic Speedways"



Record-Breaking Soldering Job Accomplished with ALLIS-CHALMERS INDUCTION HEATERS

BEHIND your taken-for-granted telephone is busy *Western Electric* — manufacturing and supplying units of the Bell System. The Allis-Chalmers induction heater is typical of the scientifically engineered machinery utilized by Western Electric in turning out record-breaking quantities of equipment and apparatus essential to dependable service.

In Western Electric's ultra-modern cable sheathing operation, four Allis-Chalmers 50-kw induction heaters at Kearney, N. J., and four identical units at Chicago make up electronic speedways.

Telephone cables 1¼-inch through 3-inch outside diameter race beneath specially designed induction coils which induce heat into

the overlapping areas of the corrugated metal sheathing enclosing the cables. Amount of heat induced depends upon cable speed. Voltage-generating tachometers, magnetic amplifiers and saturable reactors control amount of heat supplied by the coils. Heat is accurately controlled through all speed ranges.

Mr. Hi Frequency is ready and able to help you, too

If your job is one of brazing, soldering, hardening, annealing, or melting, it will pay you to get all the facts on induction heating. Contact your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS



A-5373

Just pick up your phone—



get price quotations, expert advice, prompt delivery



from your Superior Warehouse Distributor

Up against a tubing problem? Call your nearest Superior distributor. He's well stocked with quality tubing and information. Often he can make money-saving recommendations. Through his contact with the mill he can expedite information and orders for you. Let him show you why Superior tubing offers you real economy. Call on him today. He can save you valuable time and money.

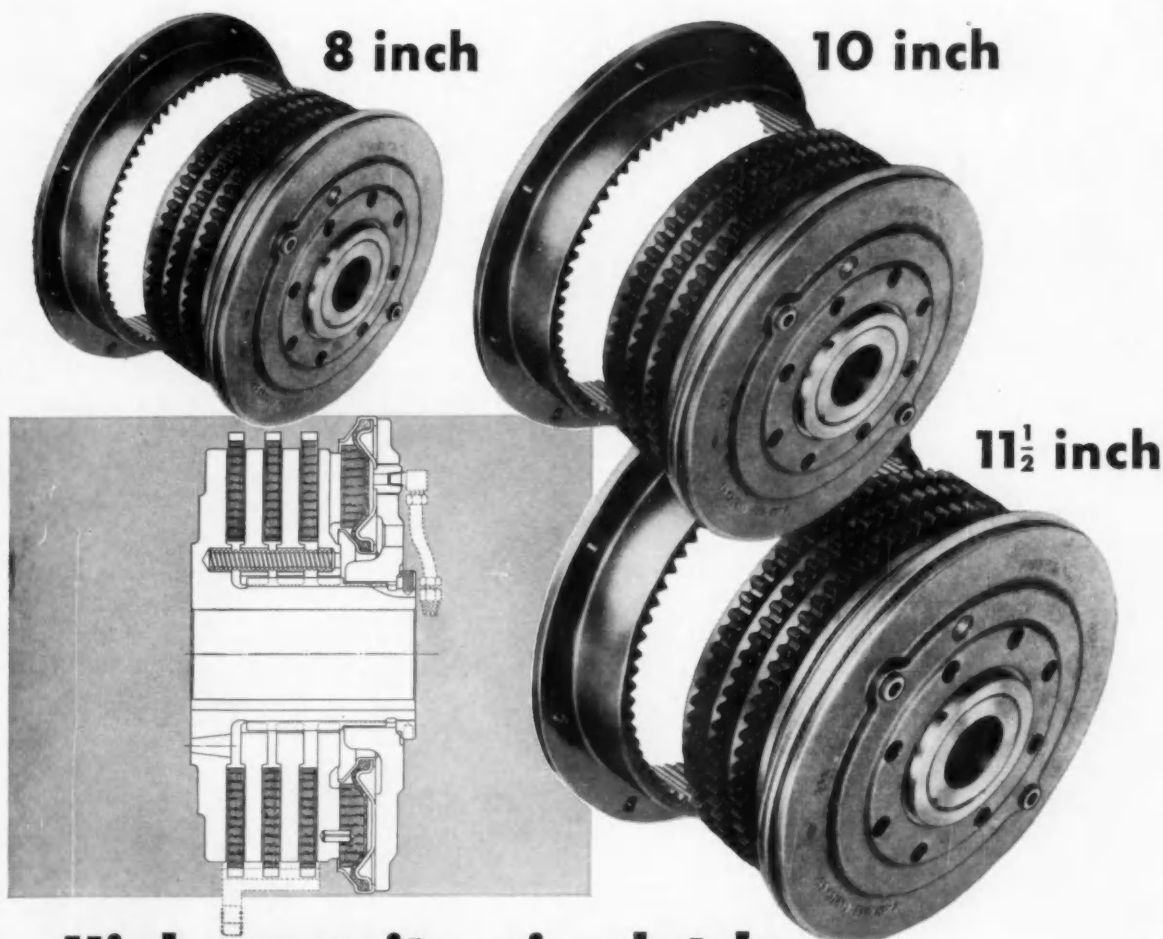
For general information on Superior tubing, get a free copy of Bulletin 40. Write Superior Tube Company, 2020 Germantown Ave., Norristown, Pa.

Superior Tube

The big name in small tubing

NORRISTOWN, PA.

All analyses .010 to 3/4 in. OD—certain analyses in light walls up to 2 1/4 in. OD



High capacity air clutches ... up to 40% less in cost

Having clutch problems? ... Then try the new low-cost Twin Disc 8, 10 and 11 1/2-inch PO Air Clutches. You'll find in these new clutches all the quality and dependability associated with the entire PO Air Clutch line—*plus these important benefits:*

- New design permits highest capacity at up to 40% less cost than comparable remote-controlled units.
- Torque capacities to 3480 lb.-ft.
- Available in triple-plate, double-plate and single-plate construction.
- Exclusive cartridge-type reinforced neoprene diaphragm eliminates leakage ... provides longest life.
- Constant torque capacity without adjustment ... self-compensating for wear.

• Narrow width permits replacement of old-style drum or band clutches ... without extensive modification or re-designing.

• Suitable for air systems up to 130 pounds per square inch.

These new PO Air Clutches are adaptable wherever the convenience of remote air control is desired. They already have proved themselves in such heavy-duty applications as rock crushers, tractor winches, pipe-extruding machines, drilling rigs, machine tools, pug mills and other industrial equipment.

Addition of the new clutches extends the Twin Disc PO Air Clutch

line from 8 to 36 inches in diameter ... to 127,100 lb.-ft. in torque capacity. There's a PO Clutch for virtually every application requiring convenient remote control for connecting and disconnecting power. Write Twin Disc Clutch Company, Racine, Wis., for complete details.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • TULSA

NEWS FROM HAMILTON!

100 to 300 ton press line sets new standards

Hamilton offers you 100 to 300 ton presses built to meet exacting automotive production standards . . . standards pioneered in the automotive field through more than 30 years of Hamilton's leadership in building presses.

Every one of these 2 point, single acting, straight-side, double-crank presses is a brand new design. Each is engineered for constant top-speed, top-quality production — without profit-robbing downtime. Each is built for complete operating flexibility. Here are a few of Hamilton's design features that will mean more efficient operation for you:

- mechanically interlocked air clutch and brake
- barrel-type motorized slide adjustment
- automatic lubrication
- pneumatic flywheel brake
- die lights
- die cushions
- pneumatic counterbalances
- interlocked electrical clutch control

Exact specifications are adjustable to your individual requirements. Special electrical controls are available to meet particular electrical standards.

It will mean money in your pocket to find out today how these all-new Hamilton presses can help you turn out high quality stampings fast . . . without costly production downtime. Get the full story on these new 100 to 300 ton presses . . . from Hamilton Division, B-L-H Corporation, Hamilton, Ohio.



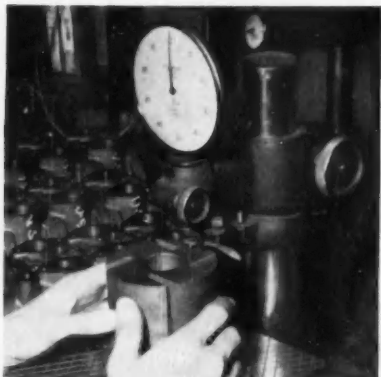
Hamilton's brand-new 250 ton double-crank press with 84 x 42 in. bed and slide.

Hamilton Division Hamilton, Ohio

BALDWIN • LIMA • HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools





Accurate machining assures the smooth, cool operation of the Wagner Rotary Air Compressor. Close dimensions on all planes of the rotor eliminate vibration... permit compressor blades to function smoothly at high speeds.



Accurate machining and gauge testing of the stator, as well as the rotor, also contributes to the rotary compressor's ability to operate for long periods of time without developing leaks or losing efficiency.



Compressor shafts are given the "cold box" treatment. When exposed to very low temperatures, the shaft diameter contracts. This altered shaft diameter allows proper insertion into a heated rotor to form a strong, composite unit.



Compressor rotors are subjected to high oven temperatures to expand rotor diameters. Shafts and rotors joined together under these extreme conditions resume their original relative size to create an extra strong assembly.



Assembled rotary compressors are hooked up to air lines and operating air pressure is applied for leakage tests. While holding pressure, entire compressor is submerged to determine whether any air is escaping.

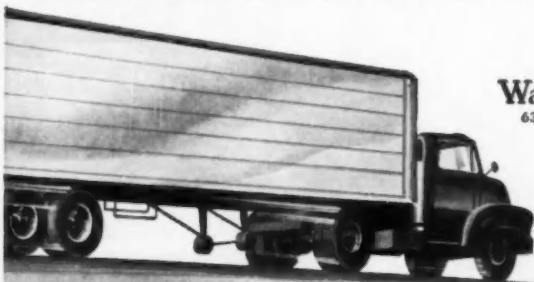


Every Wagner Rotary Air Compressor is given a rigorous "run-in" test to determine its resistance to overheating and its overall performance. Running temperatures, vibration, noise and air output are carefully noted and analyzed.

Rigid Quality Control assures uniform, safe performance and efficiency of all **WAGNER ROTARY AIR COMPRESSORS**

Wagner Rotary Air Compressors set exceptional records of safe performance, dependability, and air brake operating economy because of Wagner's "Quality Control" manufacturing program. Every Wagner Compressor must pass rigid inspection and tests before being released for shipment. That's why every user of a Wagner Rotary Air Compressor can rely on an adequate supply of air pressure

at all times, fast air recovery, long service life, and *safer* brakes. The vehicles you manufacture will be safer if they are equipped with Wagner Air Brake Systems—supplied with Wagner Rotary Air Compressors. Complete details on Wagner Air Brake Systems, Rotary Air Compressors, and other Wagner Air Brake Components are contained in Catalog KU-201. Write for your file copy today.



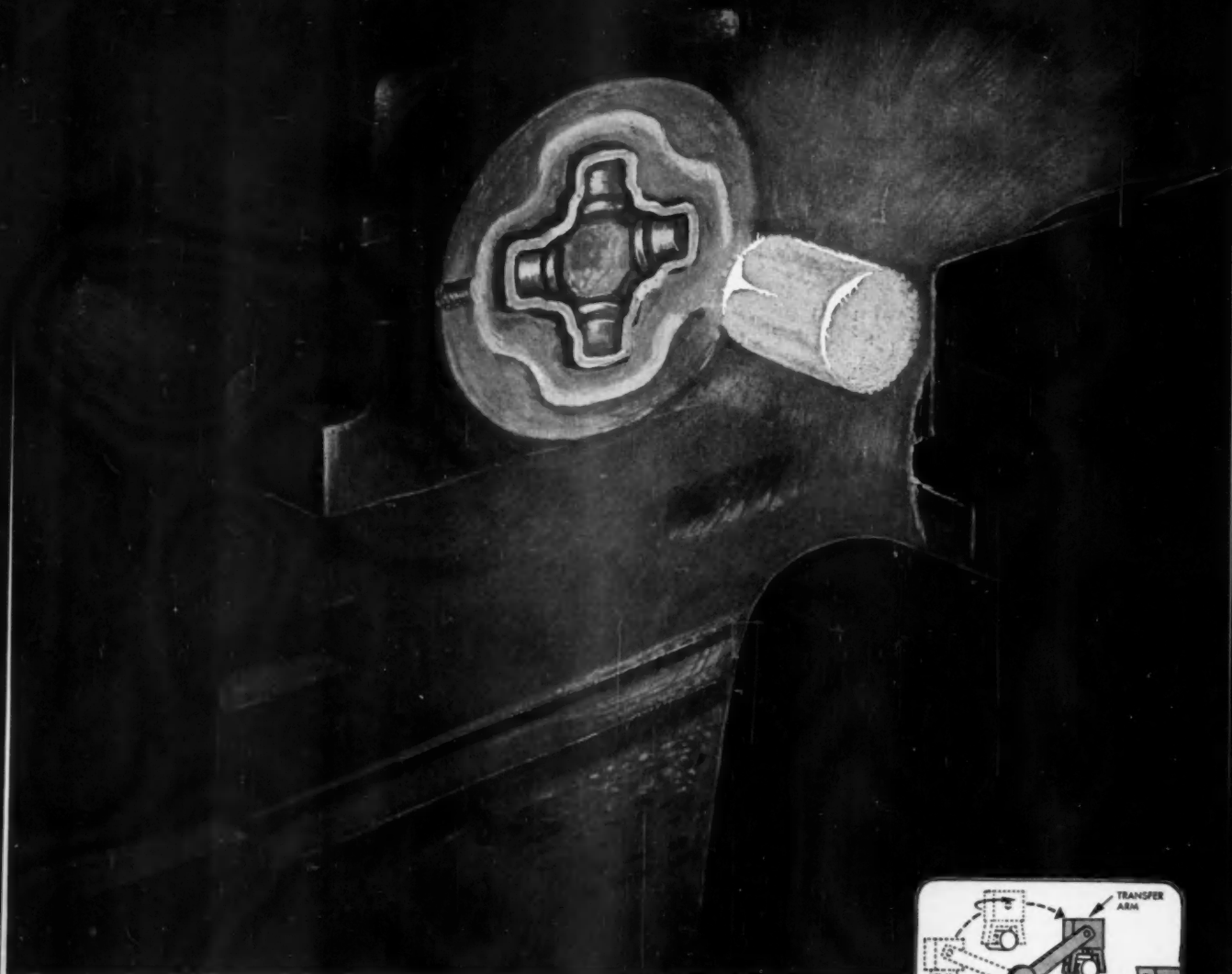
Wagner Electric Corporation
6363 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U.S.A.



K57-12



LOCKHEED HYDRAULIC BRAKE PARTS and FLUID • NoRoL • CoMoX BRAKE LINING • AIR BRAKES • AIR HORNS • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES



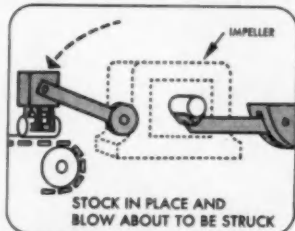
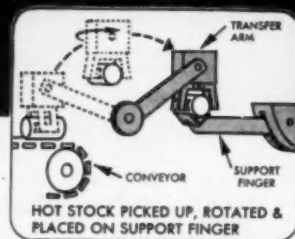
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Shockless, vibrationless forging



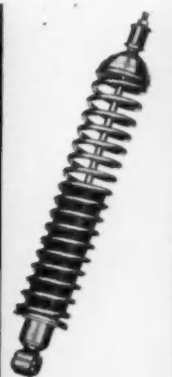
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THE CECOMATIC FORGING PROCESS



Safety
Comfort
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**MONROE
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Calibrated
Ride Control
with Any Load

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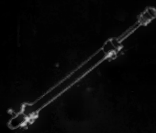
The Greatest name in Ride Control



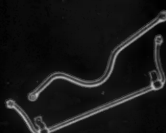
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on more makes of cars
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MONROE AIR-O-STEER
Power steering for air-
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Installed in 2 hours.



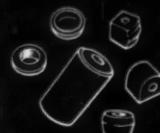
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Specified as standard
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E-Z RIDE SEATS — Stand-
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than all other seats of
this type combined.



**MOLDED RUBBER PROD-
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for all automotive and
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MONROE AUTO EQUIPMENT COMPANY

Monroe, Michigan — World's Largest Maker of Ride Control Products

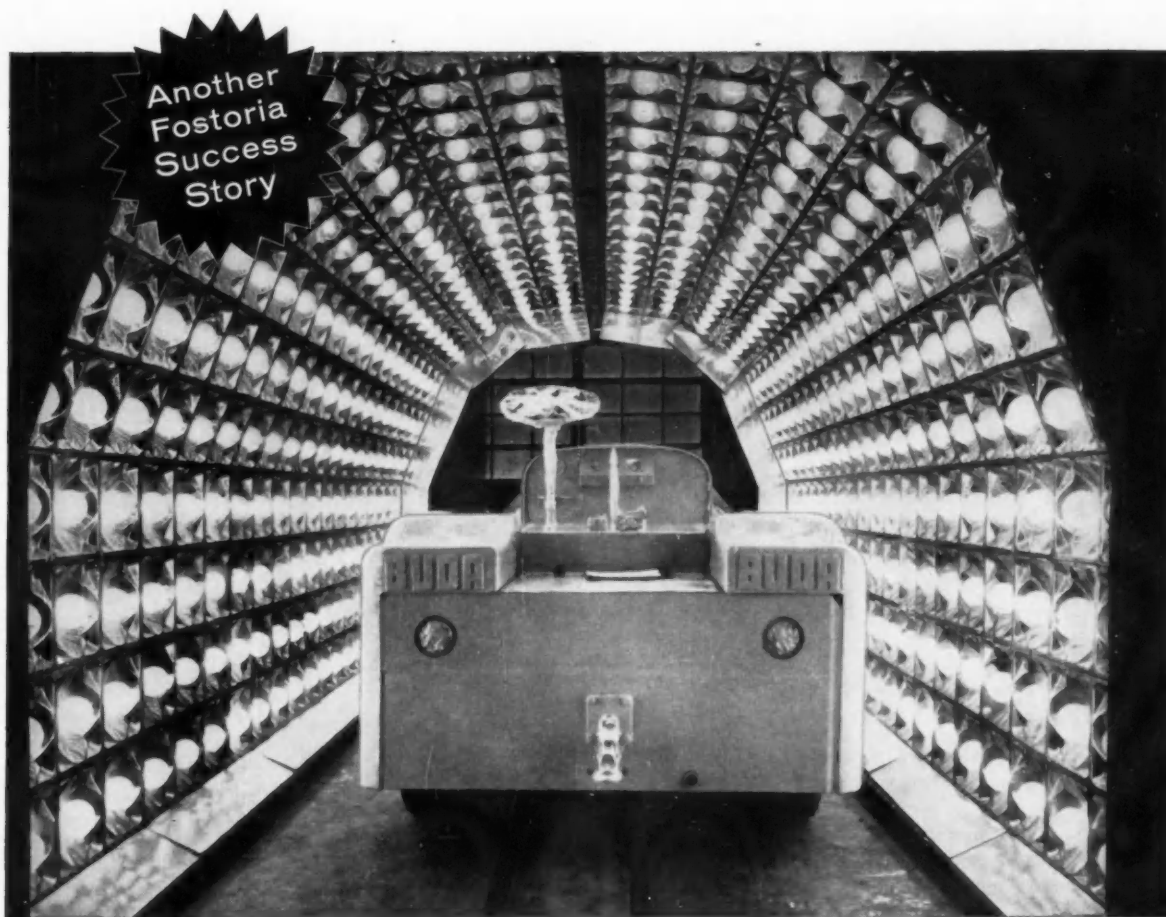
Quantity
PRODUCTION
of
GREY IRON CASTINGS

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**ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES**

*
ESTABLISHED 1866

THE WHELAND COMPANY
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE



Infrared drying lets you drive this Allis Chalmers truck *10 minutes after you Spray!*

Until Fostoria engineers were called in by the Allis-Chalmers Buda Division at Harvey, Illinois, their newly painted lift trucks and tractors took from 8 to 48 hours to dry by air. Production flow was unsteady. Units piled up in drying area.

Now, fully equipped trucks minus only the seats—with gas tanks full—move through an 18-foot Fostoria infrared oven for a thorough paint-drying that takes *only 10 minutes!* Type G-30 infrared lamps in their Fostoria-engineered oven have a total connected load of 100 KW.

Fostoria's fast, uniform infrared heating has improved production astonishingly, Allis-Chalmers officials say, while maintaining their top quality finish. The radiant oven gets more work done at lower cost.

One of Fostoria's experienced sales engineers in your area will be glad to give you latest facts on our radiant equipment widely used for heating, degreasing, drying, baking and other industrial processing. He can also arrange a convincing demonstration in your plant if you are interested. See your directory or write us for his name.



Write for free 20-page
book, "Radiant Heat—
Applications Unlimited"

**FOSTORIA PRESSED
STEEL CORPORATION**
Dept. 1129, Fostoria, Ohio

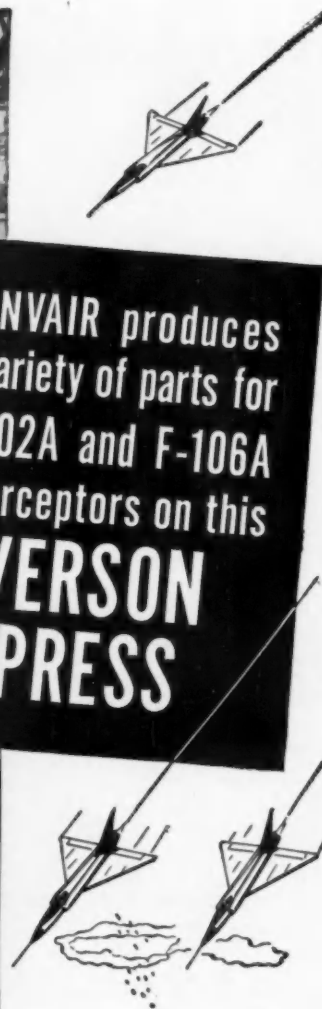


5516

Pioneer manufacturer of radiant equipment—components and complete ovens



CONVAIR produces
a variety of parts for
F-102A and F-106A
interceptors on this
**VERSON
PRESS**



At Convair's San Diego Plant II, this 1000 ton Verson Eccentric Press proves its versatility daily by blanking and forming a variety of sheetmetal parts for Convair's F-102A and F-106A interceptors.

Blanking operations can utilize the full bed-size of 68" x 156" and the press has a drawing capacity of 8". One method in the blanking operation employs a "Standard Master Die Set," wherein inexpensive "pancake" type dies are drilled in a master drill jig to provide the attach holes for the master die set. Another method uses large blanking dies, designed and

built with self contained guide pins and bushings.

After nearly three years use, detailed records show only a bare minimum of maintenance. Service such as this has gained for Verson, a reputation throughout industry as a builder of fine presses, outstanding in their versatility.

You can achieve greater efficiency and lower costs by taking advantage of Verson's unexcelled know-how. Let us make specific recommendations from an outline of your requirements. Write or phone, today.

A Verson Press for every job from 60 tons up.

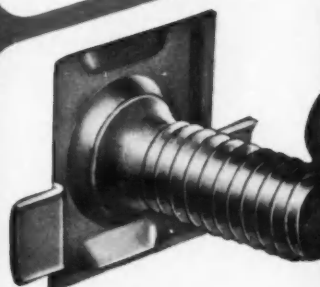


ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

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MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • Verson-WHEELON HYDRAULIC PRESSES



Blind assembly costs cut in half with **SPEED GRIP®** Bolt and Nut Retainers

A tip-in . . . a sidewise pull . . . and this new front-mounting SPEED GRIP Bolt and Nut Retainer is locked in the panel without special tools or skills.

The exclusive SPEED GRIP locking feature provides enough lateral drift to compensate for normal production misalignment of the parts to be fastened together.

Blind-panel assemblies no longer require awkward, time-consuming acrobatics for fastening. The problems caused by damaged threads in welded, staked, or clinched fasteners are eliminated. SPEED GRIPS can be slipped into place anywhere on the production line.

These convenient, time-saving SPEED GRIPS are available to fasten a wide range of unit sizes and bolt diameters to a variety of panel thicknesses. Ask your Tinnerman representative for samples and engineering data. All major telephone directories list your closest Tinnerman Sales Engineer. Or write to

TINNERMAN PRODUCTS, INC.
P. O. Box 6688 • Dept. 12 • Cleveland 1, Ohio

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Speed Nuts®



FASTEST THING IN FASTENINGS®

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Tinnerman Accessories Ltd., Telford, Walsley, W. FRANKS. DIVISION S. A. 3 rue Edouard de Belloc, Paris, France. BELGIUM: Smeets-Verheyden, Antwerp.

Frauenthal 1200 Series

☆ single spindle vertical precision grinders



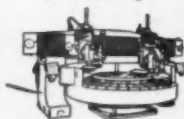
Bird's-eye view of a new Frauenthal 1200 Series (belt-driven) single spindle, vertical precision grinder. These versatile machines are

designed to meet a broad range of present requirements . . . are readily adaptable to future requirements.

F

**PRECISION
PRODUCTION
VERSATILITY**

2200 Series
72-150" Swing



1800 Series
60-72-84" Swing

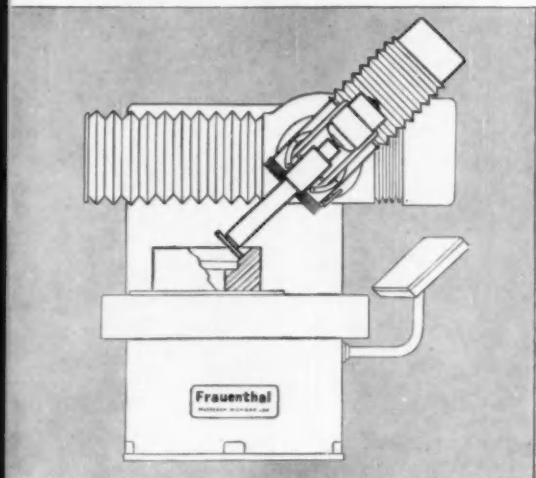


3100 Series
60-72-84" Swing

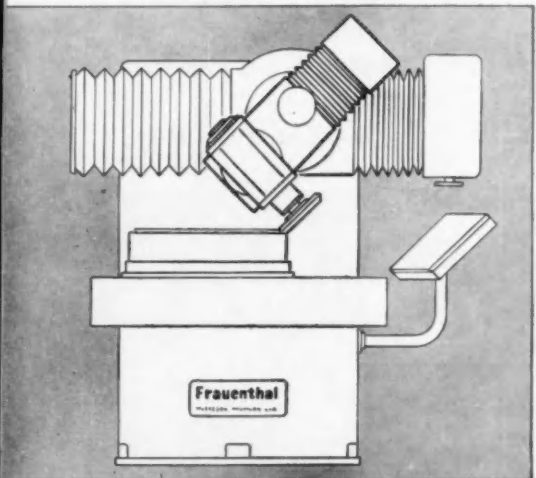


creatively engineered

... accuracy to .000100" at spindle nose



Frauenthal belt-driven Model 1224B and 1236B single spindle, vertical precision grinders have an extreme angle setting of compound at 45°. Versatility such as this permits angle, internal, external and face grinding to millionths-of-an-inch related tolerances.



Frauenthal direct-connected Models 1224D and 1236D are ideal for rotary surface grinding, O.D. surface and angular approach grinding operations. A variety of grinding spindle positions is possible with this head arrangement.

**assures uniform,
super-precision
part after part!**

Super-precision is the natural result of overall Frauenthal single spindle, vertical precision grinder rigidity; of proven performance . . . and *continuous* application of advanced grinding techniques.

These new Frauenthal 1200 Series machines are available with choice of belt-driven or direct-connected grinding spindles. Machines with either spindle arrangement are offered with 24" dia. tables x 36" swing and 36" dia. tables x 48" swing capacities inside splash guards. Additional swing can be obtained by removing guards.

Write for free
Bulletin



1200 Series
36-48" Swing



Special Grinding
Machines using
standard Slide Units



Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.

New Bendix SM-E Connector

(smaller, lighter than AN-E but equally dependable)



Here is the newest in the ever growing family of Bendix* environment resistant connectors. The new SM-E Series (Short "E") will provide the same performance as the standard AN-E connectors, but is shorter, lighter and more easily serviced. Not only does this connector conform to the vibration resistant requirements of the "E" connector in the MIL-C-5015C government specification, but it also provides effective moisture barriers both at the solder well ends and mating surfaces using the full range of wire sizes. Of particular interest to production and maintenance people is the back nut design, which provides a jacking action on the grommet during disassembly, thereby lifting it free of the solder wells. This feature when combined with the new Bendix "slippery rubber" grommets makes easy work of wire threading and grommet travel over the wire bundles.

Available in all standard AN shell sizes and tooled for most of the popular AN configurations.

Write for complete descriptive folder.

*TRADEMARK



Comparison based on size 40 mated assemblies. Space savings for smaller sizes are proportional.



SCINTILLA DIVISION of
SIDNEY, NEW YORK



Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

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**STOPS
PIPE THREAD
LEAKS**

PAT. PENDING

Satisfaction Guaranteed Or Money Back TRIAL OFFER

THE O-RING Fittings are guaranteed to seal pipe thread connections permanently against all oils, practically all known chemicals and gases; to seal under high pressures or vacuum; to withstand —280° to plus 500° F.; to eliminate "overtightening" damage and pipe dope. Available in 1/8" to 2 1/2" pipe thread sizes.

\$10.00 Trial Offer No. 1: eight 1/8", ten 1/4", eight 3/8", ten 1/2" pipe thread **THE O-RING** Fittings.

\$10.00 Trial Offer No. 2: eight 1/8", ten 1/4", four 1" pipe thread **THE O-RING** Fittings.

Send order to

TRU-O-SEAL DIVISION
Flick-Reedy Corp.
2028 N. Hawthorne Melrose Park, Ill.

"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.

1 Thread **THE O-RING** on pipe or fitting (no messy pipe "dope" needed).

2 Thread pipe or fitting & threads into port. Point in desired direction.

3 Tighten **THE O-RING** to complete leakproof assembly (only light torque required).

**"KERODEX" protected
hands wash clean
without scrubbing.**



even sticky tar
removed easily
in minutes.

"KERODEX" spreads on like a cream but acts like an invisible glove to shield the skin from the vast majority of industrial irritants such as acids, alkalis, solvents, paints, cutting oils, and resins. "KERODEX" does not smear. It does not affect materials handled, nor is it affected by them. Two types of "KERODEX" are available for "wet" and "dry" work. Write for full information on "KERODEX", barrier creams to Ayerst Laboratories, 22 East 40th Street, New York 16, N. Y.

5759



You can't BUY it until we TRY it

Few engineers have had the pleasure of seeing a new design spring into production without bugs. Many have been wounded by bugs that survived exhaustive lab tests, and emerged in production quantities on the road. American Brakeblok's on-the-road fleet testing prevents this painful experience.

To insure complete design confirmation, pilot production samples are subjected to field service conditions in cars and trucks completely instrumented to furnish comprehensive test reports. In addition, American Brakeblok's nationwide field service engineering is available to assist in your own evaluations.

For a complete picture of American Brakeblok service, send for the 20-page brochure, "Taming Dynamics with Engineered Friction." Good reading.

Complete Test Data Confirms New Designs

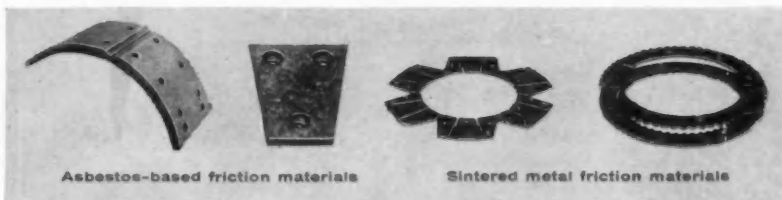


Sample data pages prepared for customers from tests



Drums and linings inspected after each test run

**American
Brakeblok**
REG. U. S. PAT. OFF.
FRICTION MATERIALS



Asbestos-based friction materials

Sintered metal friction materials

Brake Shoe
COMPART

AMERICAN BRAKEBLOK DIVISION
DETROIT 9, MICHIGAN

Resistance Welding High Speed Cylinders

SCI AKY

HELPS PUT PROFIT
INTO MANUFACTURING

Sciaky Techniques Provide Strength, Finish and Balance Critical to Profits in Fabricating Cleaning Drums

The advantages of strength, surface finish, weight reduction, corrosion and distortion resistance, leakproofing, etc., can actually be "welded" into a wide range of assemblies when proper resistance welding techniques are used.

A good example is the Western Laundry & Machinery Co., North Kansas City, Mo., manufacturers of dry cleaning equipment for automatic soaking, washing, and spin drying clothing. They adopted Sciaky Resistance Welding Techniques for assembling the cleaning cylinder and other components because *high strength, smooth finish and delicate balance* were essential qualities for optimum performance.

Welding Cylinder Assembly

The use of Sciaky Resistance Welding Techniques enables the cleaning cylinder assembly to withstand these difficult operating conditions:

- Rotation speeds exceed 90 miles per hour . . . and a full load of soaked clothing exerts a centrifugal force of 41,600 lbs. on sides of the cylinder. *Sciaky resistance welding techniques provide the STRENGTH required—at least as strong as either of the metals welded together!*
- To protect clothing in cylinder, there must be absolutely no rough surfaces. To verify this, all surfaces are rubbed with a 51 gauge silk stocking after assembly. *Sciaky resistance welds are practically invisible, providing exceptionally smooth surface finishes!*
- The cylinder must be perfectly balanced to prevent flying to pieces in operation. *Sciaky resistance welding virtually eliminates warpage and distortion and adds no weight to assembly!*

Broad Use of Resistance Welding

In addition to the cylinder assembly, Western Laundry uses the same Sciaky Patented Three-Phase Resistance Welder to perform seven other fastening jobs in the manufacture of this dry cleaning machine.

This broad use of resistance welding in a single product results in *improved performance standards—enables this*

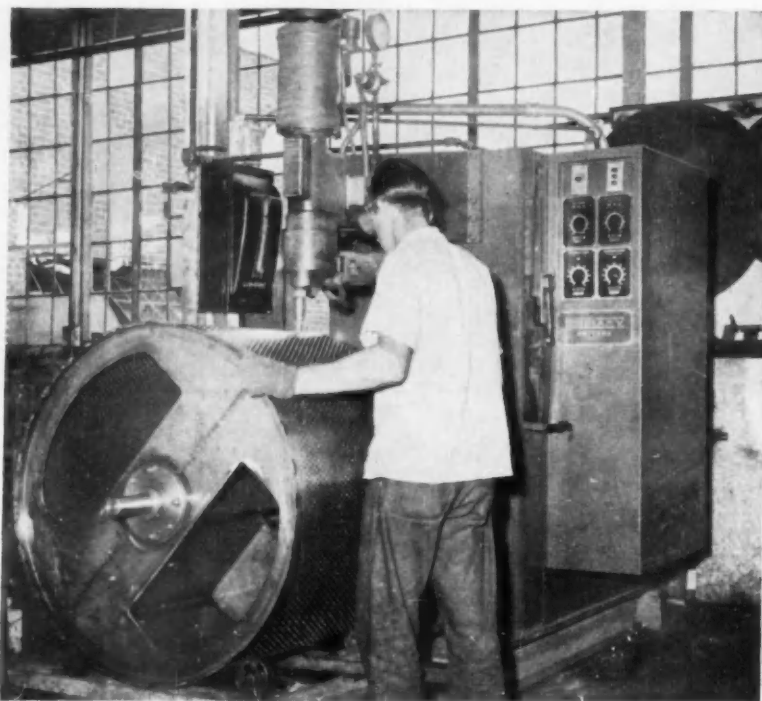


Fig. 1 Joining 12 gauge cold rolled, perforated steel cylinder wrapper to housing. Welding is accomplished at flanged edge of head. The wrapper is formed in two semi-circles. The ends of the semi-circles butt against projecting edge of two partitions. This joint is fused with an arc welding torch.

equipment to handle bigger cleaning loads faster and more profitably. Sciaky Resistance Welding Techniques help Western Laundry back up their claim that these dry cleaning machines represent lifetime purchases.

Formerly, all the fastening jobs were performed by costly riveting and fusion welding methods—which limited the operating efficiency.

Never a Breakdown

Western Laundry reports they have never had a breakdown of consequence since they installed their Sciaky resistance welding equipment in 1951.

Information Available

Case histories outlining the successful use of Sciaky Resistance Welding

Techniques are available on request. Specific recommendations will be furnished on receipt of an outline of your requirements.

Write today, mentioning the information you would like to receive. No obligation. Sciaky Bros., Inc., 4925 W. 67th St., Chicago 38, Illinois. POrtsmouth 7-5600.

60D

DO YOU HAVE A RESEARCH PROBLEM?

Facilities of the Sciaky Research Division at Los Angeles, California, are available for contract research to answer resistance welding problems. Write for further information and ask for 20 page Research Division brochure.

Design "Low Cost" Into YOUR Equipment

GITS

*World's Largest Selection of
Low-Cost Lubricating Devices*

CLIPS FOR ATTACHING TUBING

When ordering,
specify $\frac{1}{8}$ ", $\frac{3}{16}$ "
or $\frac{1}{2}$ " tubes.
Style TF.



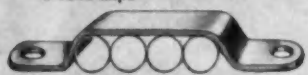
Single Clips



Double Clips



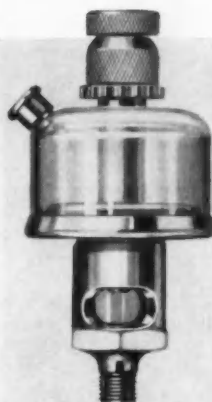
3-Tube Clips



4-Tube Clips



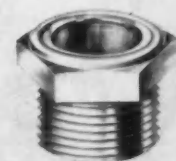
Double Clips — Wing Type



SIGHT GRAVITY FEED OILERS

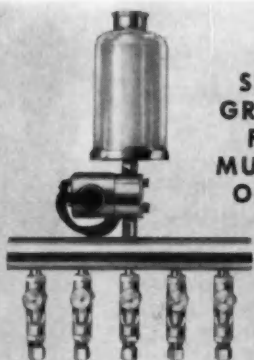
Rate of oil
flow regulat-
ed by needle
valve, direct-
ly observed
through sight
glass in stem.

Shut-off knob does not affect
needle valve adjustment. Visi-
ble oil supply. Non-breakable.
Tops in convenience and de-
pendability, at low cost. Style
NFU—No. 3602-A.



GEAR CASE GAUGES

This oil gauge plug permits in-
stant checking of oil level within
a transmission or gear case. For
use where construction permits
insertion in tapped hole. A val-
uable addition to any such
equipment — at very low cost.
Style BW—No. 4042.



SIGHT GRAVITY FEED MULTIPLE OILERS

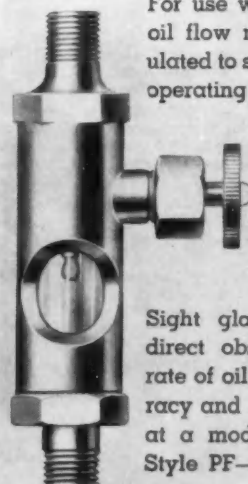
This one unit replaces 3 to 8
individual oilers. Maximum
practicality in a small central
lubrication system. Positive cut-
off during idle periods. Individ-
ual vibration-proof needle valve
adjustments. With solenoid con-
trol (Illustrated): Style MDS—
No. 4685-A. Without solenoid:
Style MD.

SIGHT GAUGES

For use where rate of
oil flow must be reg-
ulated to suit changing
operating conditions.

Needle
valve
permits
extremely
accurate
adjustment
of oil feed.

Sight glass provides
direct observation of
rate of oil flow. Accu-
racy and convenience
at a moderate price.
Style PF—No. 4290.



LUBRIKIT . . . An assort-
ment of 95 oil cups of 29
different types. Gits sales
records show these oilers
are most used for replace-
ment and maintenance.
Contents of each separate
bin are clearly described
on Inside Cover.

Special Introductory Price
Just **\$14.95** F.O.B. Factory
Satisfaction or your money back



Don't price yourself out of the mar-
ket. When you design proper lubri-
cation into your equipment, specify
GITS Lubricating Devices—the wid-
est selection available anywhere.
The items pictured above are only a
few of our many thousands of lubri-
cating devices. At the design stage,
get the GITS story. Free Engineering
Service. Send NOW for your free
Catalog.

GITS BROS. MFG. CO.

The Standard For Industry For Almost Half A Century

1870 South Kilbourn Avenue
Chicago 23, Illinois

Clip this page for handy "rough reference"

TROUBLE FREE *with thousands in use*

WIRE INSERTS PUTS CAST IRON WEAR IN TOP RING GROOVE

G and E Wire Insert Piston before machining (left) and after ring grooves are cut (right) showing how the steel wire forms a tough wear-resistant surface on both faces of top ring groove. The ferrous plug molded in the head (for diesel pistons) prevents burning through head and lengthens diesel piston life!



G and E WIRE INSERT PISTONS

- ★ **Low initial cost—
Low cost per mile**
- ★ **Amazing increase
in piston life**
- ★ **Maintains
new engine power
and performance**

GET THE G AND E WIRE INSERT STORY—It will save piston money, maintenance costs, and cut operating costs.

With the thousands of G & E "Wire Insert" Pistons in use for periods up to 3 years—NOT A SINGLE FAILURE of the "Wire Insert" has been reported to us. The "Wire Insert" greatly reduces top ring groove wear and increases piston life. It stays put—DOES NOT COME LOOSE! It can never cause internal engine damage that results in break-downs on the road and emergency overhauls.

The "Wire Insert" piston design—exclusive with G & E—combines all the advantages of aluminum alloy pistons with the long life of steel in the top ring groove. No noticeable increase in weight—no interference with heat flow—and the cost is barely more than ordinary alloy pistons.

You get longer piston wear at lower cost because G & E Wire Insert Pistons have a pre-shaped steel wire cast right in the piston wall where the top ring is located. When the grooves are machined, this tough wire is cut, exposing the closely spaced hard surfaced bearing points on top and bottom faces of the groove.

GILLETT AND EATON, INC. 841 DOUGHTY STREET • LAKE CITY, MINN.



ESTABLISHED 1869

**RIGHT
for
the job**



The world's largest and longest truck, developed by the U.S. Army Ordnance Corps to transport tanks, is 90 feet long. There are drivers at both ends of this experimental truck.

...as **EVANS HEATERS** are right for trucks !

You can't transport army tanks on an ordinary vehicle nor can you heat a truck properly with a heater built for passenger cars. Both jobs require specially designed equipment.

There's nothing quite as right for heating trucks as Evans Heaters, because *they're* built for trucks.

The materials that go into Evans Truck Heaters are as dependable as the materials used in the truck itself. Each Evans Heater is custom designed for the job it has to do. In that way, you *know* you have a heater that's *right for the job!*

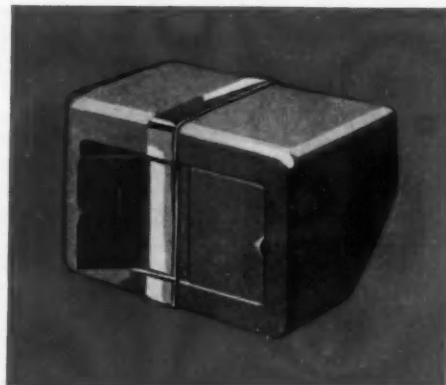
For engineering service or a catalog of Evans Heaters, write Evans Products Company, Department P-11, Plymouth, Mich.

Regional Representative Cleveland, Frank A. Chase
Chicago, R. A. Lennox Co., Inc. • Detroit, Chas. F. Murray Sales Co.
Allentown, Pa., P. R. Weidner

**EVANS HEATERS ARE RIGHT FOR TRUCKS
BECAUSE THEY'RE BUILT FOR TRUCKS**

EVANS PRODUCTS COMPANY ALSO PRODUCES:

railroad loading equipment; bicycles and velocipedes; Evaneer fir plywood;
fir lumber; Evanite battery separators and Evanite hardboard.





Here's all it takes

TO CONVERT THIS NEW WESTINGHOUSE COMBINATION LINESTARTER FROM NON-FUSED TO FUSED!

or change fuse clip ratings from 30 to 400 amp

This is flexibility!

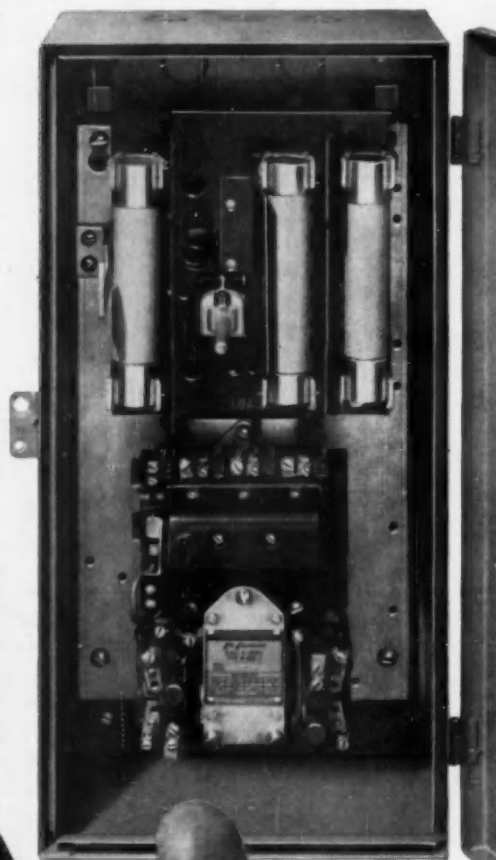
This is the new Westinghouse combination Life-Linestarter® with the Visi-Flex switch! . . . the convertible switch that enables you to modify the new Westinghouse combination linestarters (in sizes 0 through 4) to meet both your present and future power requirements by simply adding or changing a set of fuse clips.

All it takes is a screwdriver, a Westinghouse Fuse Clip Kit, and about five minutes of your electrician's time to change from non-fused operation to fusible, or to vary fuse ratings from 30 through 200 amps 600 volts, and 400 amps 250 volts, over a range of four switch sizes.

What's more, the new Westinghouse Life-Linestarters with Visi-Flex switch are up to 25% smaller than the old design—good news for plant engineers with a space problem.

For plants which face adverse operating conditions involving lint, dust, or oil seepage, the new linestarters are available in the NEMA-12 dust-tight enclosure, as well as the standard NEMA-1 shown at right. And—they're available *now*, from local warehouse stocks. Simply call your nearby Westinghouse sales office or distributor.

J 30284

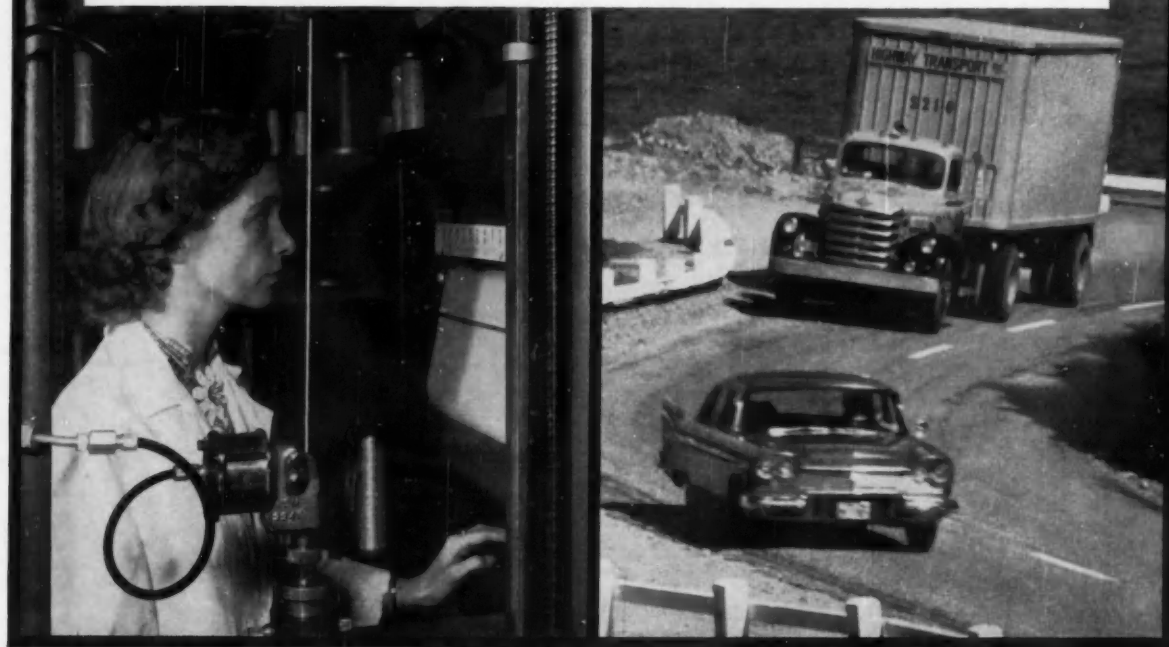


YOU CAN BE SURE...IF IT'S **Westinghouse**



THIS LABORATORY TEST of cords taken from test-fleet tires proves that ordinary tire cord loses strength from flexing twice as fast as nylon tire cord . . . proves that nylon cord gives lasting strength for safety and endurance.

IN THE FINAL TEST, the lasting strength of nylon tire cord has been proved in billions of miles of heavy-duty service on trucks. Nylon cord tires are standard equipment on commercial airlines, too.



TEST AFTER TEST PROVES NYLON TIRE CORD GIVES EXTRA STRENGTH FOR EXTRA SAFETY



These influential magazines will carry Du Pont nylon cord tire advertising throughout the year. These ads tell your customers of nylon's lasting ability to shrug off the continual abuse of day-after-day driving and thus offer utmost safety on the highway.

The lasting strength and safety of nylon tire cord have been proved both in the laboratory and on the highway. Nylon cord withstands the added strains of today's more powerful cars and the sustained speed permitted on superhighways. Nylon cord protects against the four major causes of blow-out: heat, moisture, flex fatigue and bruise damage . . . gives motorists added safety and dependability they want in a tire.

Nylon cord tires can reduce unsprung weight, and nylon's shock-absorbing toughness can take the additional strains of power steering, power braking and higher horsepowers. Surveys and rising sales both show that today's motorists know and want the extra strength and safety of nylon cord tires, the tires made to meet modern driving needs.

40% of all passenger-car replacement tires sold are nylon.



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Today, the strongest, safest tires are made with nylon cord



ANOTHER IDEA-PROCESS FROM A.O. SMITH...

Putting all the metal to work with



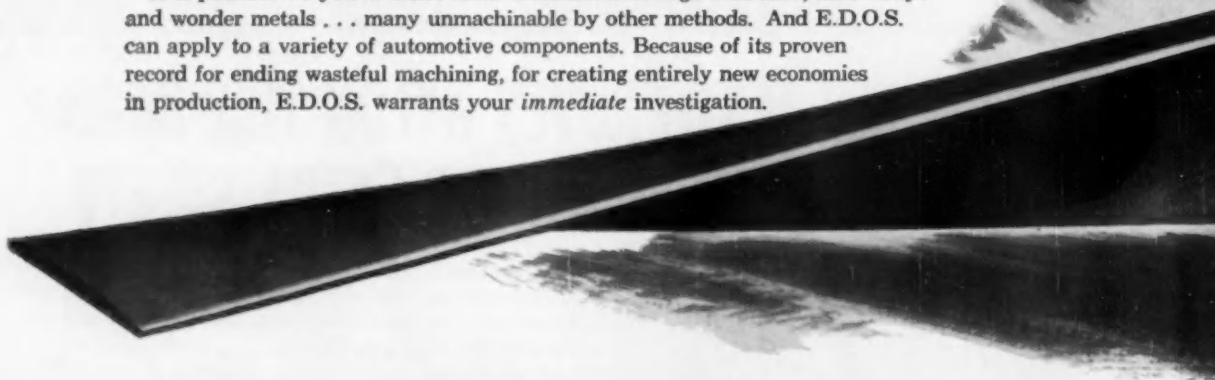
New "total use of metal" process from the auto industry's No. 1 frame supplier

Since 1902 A. O. Smith has mass produced nearly 55 million chassis frames . . . for virtually every make of American car. Our talent — creative mass production, unique ability to keep pace with your progress.

This steam turbine blade is a current example of A. O. Smith's production creativity. It was formed by our new E.D.O.S. process — which has *already* brought dramatic savings (as high as 70% compared to conventional methods) in metal and machining time to the aircraft and other metal fabricating industries.

Developed by A. O. Smith research, E.D.O.S. means engineered designs for optimum structures. Specifically, it consists of precision forging, contour rolling, flash and fusion welding . . . to put all of the metal to work.

It is possible for you to make these remarkable savings with steel, hard alloys and wonder metals . . . many unmachinable by other methods. And E.D.O.S. can apply to a variety of automotive components. Because of its proven record for ending wasteful machining, for creating entirely new economies in production, E.D.O.S. warrants your *immediate* investigation.



E.D.O.S., Engineered designs for optimum structures...



Original type 403 stainless steel billet before processing.



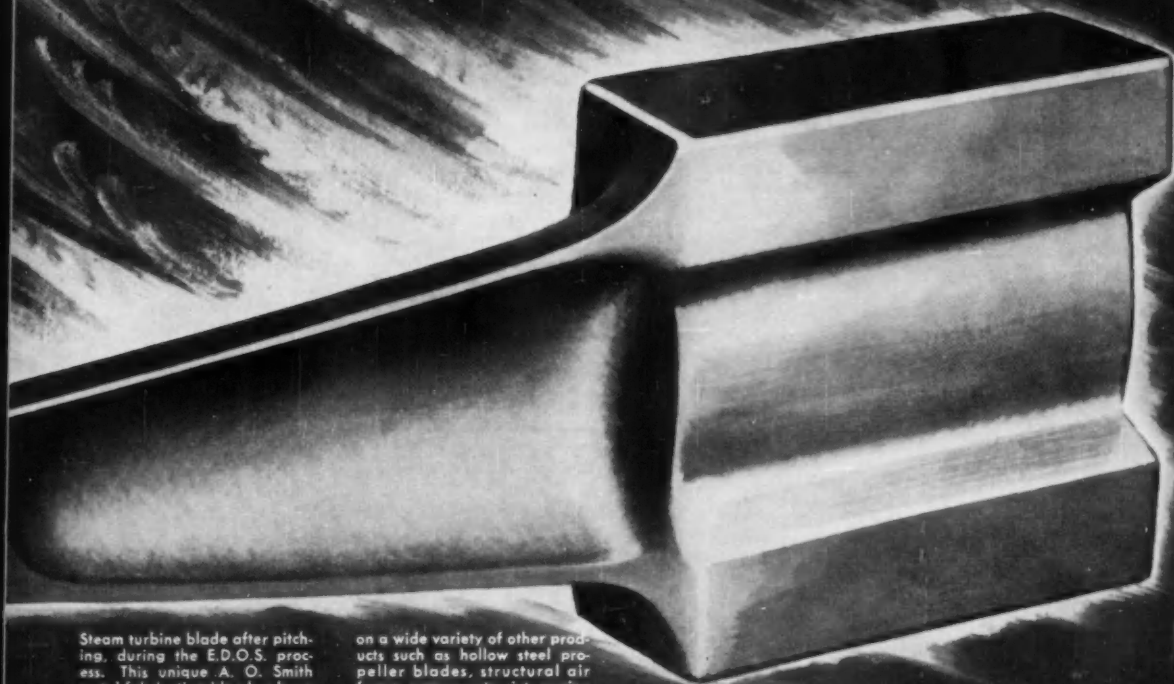
Fillout after initial precision forging operation has been completed.



Forged piece is successively rolled out to blade's full length.

... partner in your progress through creative mass production

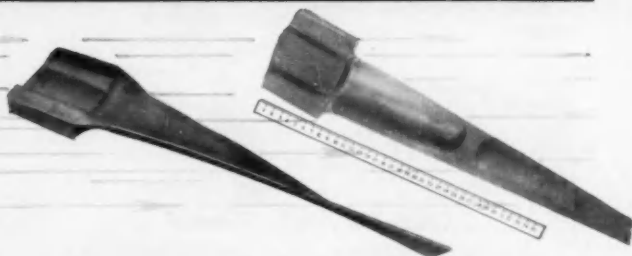
EDOS*



Steam turbine blade after pitching, during the E.D.O.S. process. This unique A. O. Smith metal fabricating idea has been creatively applied from customer prints to production run...

on a wide variety of other products such as hollow steel propeller blades, structural air frame components, jet engine spacer rings and numerous other industrial parts and assemblies.

here's how it works...



Blade pitch is accurately obtained through hydraulic press operation.

Finished blades, over 100 per turbine, are delivered to the customer, ready to be installed after simple machining on the root.

Write for Bulletin 1-17-A describing the E.D.O.S. process... just one of the many idea-processes from A. O. Smith, partner in your progress through creative mass production.

Through research  ... a better way

A.O. Smith

C O R P O R A T I O N

AUTOMOTIVE DIVISION
MILWAUKEE 1, WISCONSIN

A. O. Smith International S.A., Milwaukee 1, Wis., U. S. A.

Exciting News from **Milisco**

"Sentry" Pedestal Seat with the Milisco "LIFT-N-TILT" Feature



Operators like the Milisco patented "Lift-N-Tilt" feature of the "Sentry" seat. The spring-action lever allows for quick tilt adjustments. Complete with fore and aft adjustments also.

The Milisco "Sentry" Seat, truly the most versatile pedestal seat on the market, provides for maximum riding comfort and gives that extra sales appeal that has made the "Sentry" the "accepted" pedestal seat for panel trucks, cranes and shovels and other types of mobile equipment.



where your
seating dollar
goes farther

2730 N. 33rd St., Milwaukee 45, Wis.

Young 3-1-2 COOLING SYSTEM TREATMENT

Rust and Corrosion Inhibitor

Young 3-1-2 is a complete protective treatment for the cooling systems of diesel, gas and gasoline internal combustion engines. It prevents rust, controls scale, and protects aluminum, copper, ferrous metals, etc., from corrosion; and non-metals from deterioration.

Young 3-1-2 is furnished in pellet form, and since it is a *non-chromate* type treatment, it is non-irritating to the skin. No weighing or measuring is required: 3 pellets to 1 gallon of coolant, 2 times a year (under normal operating conditions) are recommended.

Young 3-1-2 will not deteriorate with age when stored in a dry area. It is compatible with all types of standard anti-freezes.

For further information write Dept. R107-L

Young RADIATOR COMPANY
RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Moline, Illinois

Only ONE Torque Wrench
can be accurately used
with...
**EXTENSIONS and
ADAPTERS**

It is mechanically impossible to use any Torque Wrench with adapters or extensions (with accuracy) unless that Torque Wrench has a positive, built-in, fixed load position.

This essential factor of accuracy, misunderstood or ignored in the design and manufacture of some torque tools, can completely defeat their purpose.

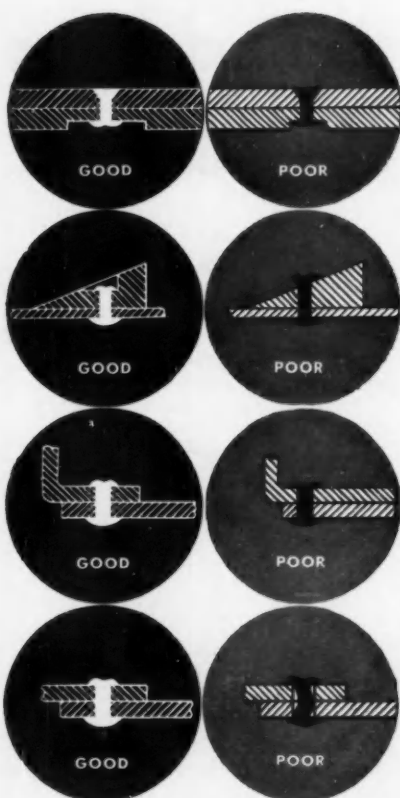
**PATENTED
PIVOTED HANDLE
FIXES LOAD POSITION**



Write for Torque Manual

with formulae tables and explanations for correct use of adapters and extensions.

PA **STURTEVANT CO**
ADDISON QUALITY ILLINOIS



TIPS ON USING RIVETS

A short design course guaranteed to save a lot of grief later on!

You could memorize these and thousands more design tips on the best use of rivets—but don't! Much simpler to call on Milford for the right answers to all your riveting design and application problems. Full-tubular, semi-tubular, split, cutlery, decorative—Milford makes them all from any metal that can be cold-formed, then adds a wide variety of platings and finishes.

To improve product appearance and strength
... to take full advantage of automatic assembly
... to cut delivery time and production costs

—get in touch with Milford first!



MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

SPEED SENSITIVE SWITCHES

UNDERSPEED
One S.P.D.T. switch to trip at speeds as low as 400 RPM. Maximum operating speed 5,000 RPM.

OVERSPEED
One S.P.D.T. switch to trip at speeds between 500 and 6,000 RPM.

OVER and UNDERSPEED
Two S.P.D.T. switches to trip at two different speeds between 500 and 6,000 RPM.

OVER—INTERMEDIATE and UNDERSPEED
Three S.P.D.T. switches to trip at three different speeds between 1,200 and 6,000 RPM.

Speeds above or below those listed above must be referred to our Engineering Department for special consideration. Request Bulletin 504 describing our Speed Sensitive Switches.

SYNCHRO-START PRODUCTS
INCORPORATED
8151 N. RIDGEWAY AVENUE, SKOKIE, ILLINOIS
Automatic Engine Control Sets—Safety Alarm Sets—Special Control Panels—D. C. Solenoids—Heavy Duty Relays

Herrmann Engineering PRESENTS

A COMPLETELY NEW CONCEPT OF RECIPROCATING ENGINES

1. Centrifugal forces are entirely eliminated
2. Reciprocal forces are offset near their source
3. Gas pressures are similarly offset except their useful resultant
4. There is almost completely uniform torque
5. One-half of the parts are eliminated—some the most costly
6. Production equipment required is mostly of standard types. Cost is about 25% of that required for current engines. Labor, etc., is 60% of present costs
7. The engine is suitable for Stationary, Marine, Bus and Truck service
8. That the engine has power and endurance has been verified by the Civil Aeronautics Administration which issued ENGINE TYPE CERTIFICATE No. 293

For literature, demonstration and liberal proposal to engine manufacturers and others having available plant, equipment and personnel, contact

KARL L. HERRMANN
1405 Air Way, Glendale 1, California
Cltus 1-5311

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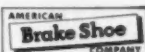
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Zollner Corp.	3rd Cover

Let me give you
this **NEW**
fact-packed
forging guide



If you buy or specify forgings, write for this fact-packed AmForge book. Its 16 pages show how your company can benefit from better AmForge research, engineering and control. You'll see that all this adds up to the kind of "service" you need for production quality and economy. Either circle the number on the magazine service card or write AmForge, Dept. AI-11, 157 N. Wacker Dr., Chicago 9, Illinois.

AMFORGE
DIVISION



VELLUMOID

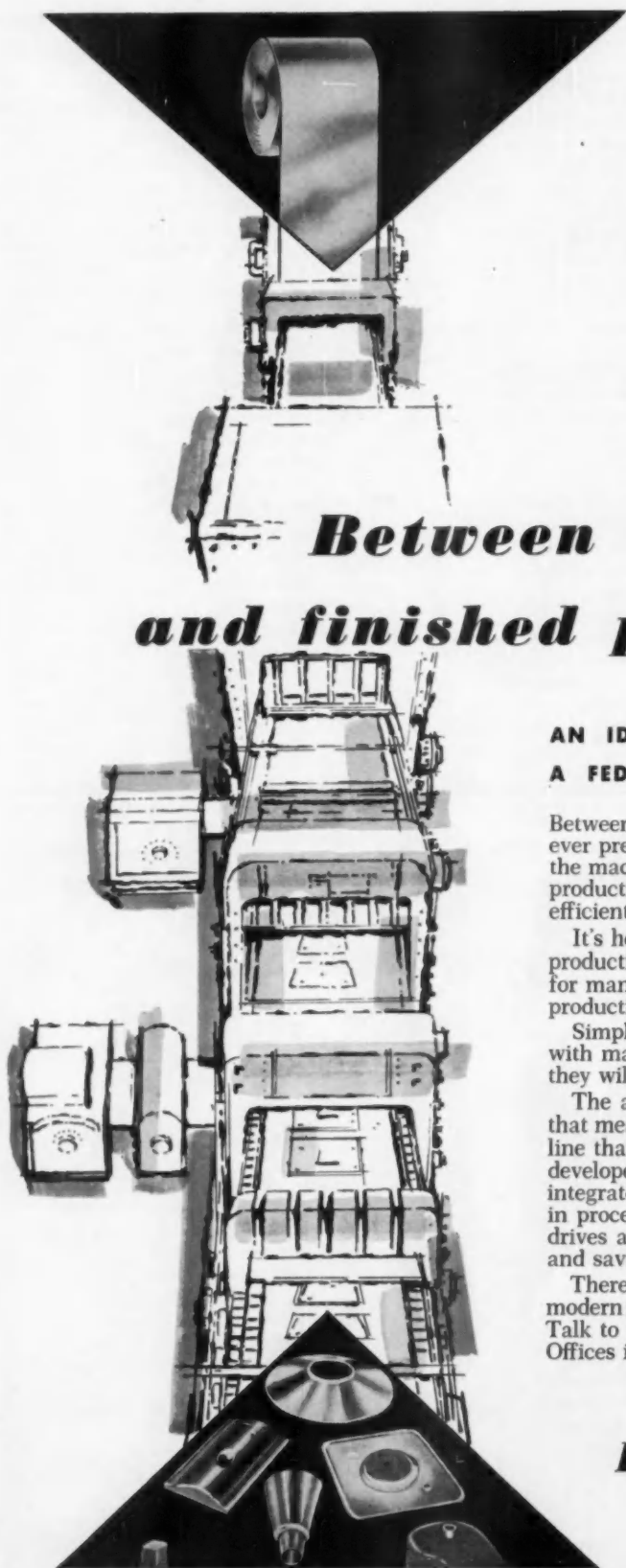
VELLUMOID for Vital Sealing Jobs

Because of Vellumoid's long experience in manufacturing the exact gasket for so many various jobs, design engineers specify Vellumoid Materials to be sure. The Vellumoid sales engineer in your territory will gladly work with your design group to be sure you get the correct gasket every time.

Specify Vellumoid Materials
for a perfect seal!

THE VELLUMOID COMPANY

Worcester, Massachusetts



Between material and finished part...

AN IDEA THAT MAKES SENSE — A FEDERAL-WARCO PRODUCTION LINE

Between material and finished part is the ever present problem of bringing together the machinery necessary to perform all production on operations as speedily and efficiently as possible.

It's here, the Federal-Warco, this packaged production line has proved to be the answer for many of the nation's foremost production experts.

Simply provide Federal-Warco engineers with material and part information and they will develop a line to do the job.

The advantages: One source responsibility that means faster, more thorough service; a line that is 100% harmonic, all stations developed especially to work in synchronization; integrated and automated handling of work in process; the possibility of utilizing common drives and bases, reducing operating costs and saving valuable floor space.

There is much more. Why not look into this modern method of production line manufacture? Talk to your Federal-Warco representative. Offices in all leading industrial areas.

Federal / Warco
PACKAGED
PRODUCTION LINES

THE FEDERAL MACHINE AND WELDER COMPANY • WARREN, OHIO

NEW

NEW
NEW

**ESPECIALLY DESIGNED FOR TOP RING
GROOVE PROTECTION IN PISTONS
FOR GASOLINE ENGINES**

**AN ECONOMICAL METHOD WITH
MINIMUM WEIGHT INCREASE**

**CAN BE APPLIED TO ANY TYPE
ALUMINUM ALLOY PISTON**



PERMA-GROOVE*

WITH SEGMENTAL STEEL TOP RING SECTION

Again, Zollner engineering leadership provides another great piston development to engine builders. The new Zollner "Perma-Groove" gives sensationally longer life to pistons and rings, prevents blow-by, minimizes oil consumption. The light weight segmental steel section incorporates high wear resistance in the top ring groove *plus* the advantage of cool operation. Designed especially for gasoline engine pistons, "Perma-Groove" is the quality, low-weight and low-cost companion to the popular "Bond-O-Loc" piston for Diesel engines. We suggest an immediate test of "Perma-Groove" advantages for your gasoline engine.

*T. M. Reg. Pat. App. For



TOP RING SECTION



FRONT VIEW SECTION



CROSS SECTION

**OUTSTANDING ADVANTAGES
OF ZOLLNER "PERMA-GROOVE"
TOP RING SECTION**

1. Individual steel segments eliminate continuous band expansion problem.
2. Segments securely locked to prevent radial movement.
3. Dovetailed edges keep steel segments securely in plane with groove.
4. 75% steel bearing area for wear resistance.
5. 25% aluminum bearing area for heat conductivity and cool operation.
6. Light in weight.

ZOLLNER

THE ORIGINAL EQUIPMENT PISTONS

PISTONS

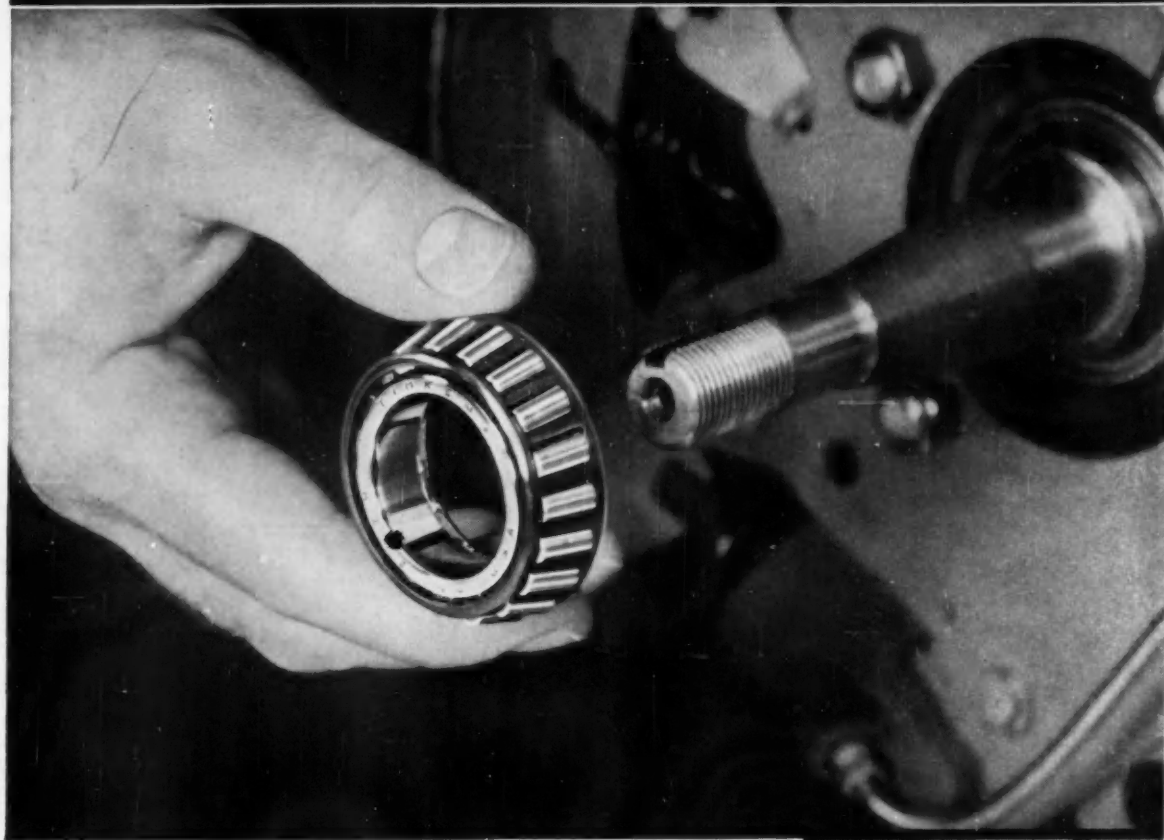
ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

**ADVANCED
ENGINEERING
PRECISION
PRODUCTION
COOPERATION
WITH ENGINE
BUILDERS**

Meeting the big change in cars with the big change in bearings:

TIMKEN® and The Moto-Mated Way



New TIMKEN® Moto-Mated bearings save space, weight, money

THERE'S a big change in cars. The auto industry spent close to \$1 billion to make the new 1957 models faster, lower, safer. To meet the big change in cars, the Timken Company launched a whole new concept in bearing design, manufacture and supply in the world's most advanced bearing factory. It's the Moto-Mated Way—mated to your industry's needs.

The Moto-Mated Way anticipates your changing requirements. It puts advanced machines to work for you. Provides you with a better, more uniform product at lower cost. Offers you an almost unlimited source of supply.

From the Moto-Mated Way comes a whole new breed of bearings—Timken® Moto-Mated bearings—in standardized

sizes. They're smaller, for more compact design. Lighter, to cut unsprung weight, improve the ride. Capacity-packed, to take the loads of today's power cars. Made with a new high in uniform quality. And they cost less because they're produced by the millions by methods never before seen in the bearing industry.

This year the automotive industry is saving up to 16% on millions of front wheel bearings by adapting to the new sizes. As your use of Timken Moto-Mated bearings grows in new car applications, we can pass along our manufacturing savings to you.

Write us for details on the Moto-Mated Way. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".



QUALITY, SERVICE, PUBLIC ACCEPTANCE MAKE

TIMKEN

TAPERED ROLLER BEARINGS

YOUR NO. 1 BEARING VALUE

See the next Timken Televent hour, "The Innocent Years" over NBC-TV, Thursday night, November 21st.